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Dr. Alexander C. Humphreys

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TO CELEBRATE DR. HUMPHREYS' DECENNIAL AT ALUMNI BANQUET

STEVENS alumni dinners are always notable for the large proportion of the total number of alumni who attend, for the good fellowship that prevails, and the spirit of harmony that is manifest between the college management and the graduates.

The dinner of 1913 will be even more important in marking a milestone in the history of the college of large significance, the celebration of a decade in the administration of Dr. Alexander C. Humphreys as executive head of the Institute.

That the celebration may be worthy of the occasion, many new features will be introduced. For the first time, the dinner will be held in the grand ball room of the Hotel Astor, whose boxes will be available, so that ladies may attend. The great organ, one of the finest in the country, has been placed at the disposal of the committee, and musical selections will be rendered throughout the dinner. The organ will be especially effective as an accompaniment to the singing.

The list of speakers will include some of the foremost engineers and educators of the country, joining with Stevens to do honor to her president. The toast list will also include many notable Stevens graduates. E. H. Peabody, president of the Alumni Association, has been asked by the committee to serve as toastmaster.

Among those who are expected to speak are Dr. Henry S. Pritchett, Dr. Palmer C. Ricketts, president of Rensselaer Polytechnic Institute; Dr. John H. Finlay, president of the College of the City of New York; Prof. Charles F. Kroeh, Prof. Albert F. Ganz, Henry Torrance, and Dr. Humphreys.

Some of the invited guests are: Job E. Hedges, John Cotton Dana, Nicholas Murray Butler, Andrew Carnegie, Frank A. Vanderlip, H. P. Davison, George G. Mason, John D. Rockefeller, Jr., G. B. Schley, Livingston Gifford, Howard E. White, R. C. Jenkinson, James Bertram, James T. McCleary, Col. George Harvey, Franklin Kirkbride, Dr. Henry S. Pritchett, Dr. Palmer C. Ricketts, Dr. John H. Findlay, T. B. Wells, F. T. Leigh, A. D. Chandler, F. A. Duneke, John Larkin, John I. Waterbury, Walton Clark, Richard Stevens, George Westinghouse, Samuel T. Bodine, Col. E. A. Stevens, Dr. Edward Weston, Richard V. Lindabury, R. A. Franks, S. S. Palmer, Edgar Palmer, E. P. Meany, V. P. Snyder, Randall Morgan, J. Edgar Bull, Chester S. Lord, Louis Wiley, C. R. Miller, Oswald Garrison Villard, Rollo Ogden, W. A. Day, J. B. Lunger, Charles B. Alexander, Frank S. Witherbee, Charles H. Zehnder, Samuel M. Felton, Bradish Johnson, Charles D. Norton, E. H. Outerbridge, Alton B. Parker, William E. Paine, W. W. Finley, Emerson McMillin, Thos. F. Ryan, T. F. C. Penfield, and Alfred B. Eaton.

THE PRESENT OPPORTUNITIES AND CONSEQUENT RESPONSIBILITIES OF THE ENGINEER *

By Alexander C. Humphreys, M.E., Sc.D., LL.D.

DOUBTLESS we are all prepared to agree that special qualifications, natural and acquired, must necessarily involve a commensurate responsibility to employ those qualifications in effective service. For many years past I have been deeply impressed with the particular responsibility of the engineer to the community, by reason of his special equipment. If, through his special equipment, he is qualified to render service to the community at large, that service should not be limited to his particular field of work.

My proposition then is that to-day, by reason of the present complex conditions surrounding the industries, there are offered to us as engineers opportunities for public service which are exceptional; and our responsibilities are the greater because these conditions were in part created by members of our profession. These opportunities are offered to us; if we refuse to accept them, we assume a grave responsibility. The fact that others are more than willing to take the lead in the effort to solve the problems which are threatening our well being as a nation does not relieve us of responsibility, but rather to the contrary. If we leave it to the lawyers, theoretical economists and others, to shape the measures of reform, then just so far as we could have bettered the result, the reproach must rest upon us. As far as possible, the work of reform should be the result of sincere coöperation on the part of all conscientious and competent members of the body politic.

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* Abstracted from President's Address delivered before the American Society of Mechanical Engineers, Dec. 3, 1912.

The question of the responsibility of the engineer must carry back to those who are responsible for his education and specific training, including not only the colleges of engineering, but also the graded schools and the employers and others in control of those employed.

With regard to the schools in which our boys are prepared for the engineering college or for a direct entry into business or industrial life, may we not charge that these schools are not as a rule conducted for the benefit of the masses? May we not claim that the public schools, supported by taxation, should be administered primarily for the preparing of the masses for self-support? The keynote in our scheme of public education should be thoroughness, and particularly with regard to the three Rs and the elementary studies in general. The course of instruction in our public schools should be shaped for the benefit of those who are *not* to enter college; that is, for those who by one cause or another are forced to become wage-earners at eighteen years of age *or less*. In the scheme, adequate provision should be made for those who do not and cannot remain in school beyond the grammar school period. This change would not work an injustice to those who find themselves in a position to continue their book and laboratory-study in the colleges. The present scheme tends strongly toward superficiality, which must be harmful to all.

In the case of those who are preparing to enter the College of Engineering, I hold that they should not be subjected to a specialized preparatory training. I hold that these boys particularly should receive a sound general training, for they are the ones who will obtain later the advantages of the specialized training. The high school pupils who are not to enter the college of engineering are the ones more in need of instruction in mechanical drawing, manual training and the like. If, in the allotted time, the boys preparing for the College of Engineering could get a sound preparation in the general studies and also get the preliminary practical training, so much

the better. But the crowded curriculum of the present day tends to prevent this. *To secure thoroughness our public schools must reduce their requirements or increase their efficiency, or both.* And in this connection it must be realized that all culture is not obtained from so-called cultural studies.

Of late years we hear much to the effect that by reason of the rapid strides made and being made in engineering science, the courses in our colleges of engineering should be extended from four years to five, six and even seven years. Included in this scheme of extension is the purpose to devote a considerable portion of the college course to the general or non-technical studies. If this is wise, then why not use the years of preparation most advantageously on the general studies? In the case of the boy preparing for the College of Engineering, why begin to specialize before he enters college? The case of the boy who is to go out from the grammar school or high school to become a wage-earner is quite different. We might, if it is practicable, specialize in his case. And here the co-operative system, the alternating of school and shop, or school and business, demands our thoughtful and sympathetic consideration. This same system carried on a higher plane is particularly worthy of our professional attention, especially as now being tried so intelligently under Dean Schneider, of the College of Engineering of the University of Cincinnati. In any case, in the four years' engineering course, the general studies should not be slighted and the technical studies should be so presented and taught as to give them the greatest possible cultural value.

For the great majority of students I cannot believe that it is the part of wisdom to extend the college engineering course beyond the four years which is now the general rule. For these men the age of graduation, on the average, is about twenty-two years. At that age a young man intended for our profession certainly should be prepared to earn a living; continuing, however, to be a student, as he must continue to be to his last

active day in his profession, if he aims to fill a position of authority.

If the college course is to be extended by reason of the many more things now to be learned, will five, six, seven, ten or even twenty years be sufficient? My answer is in the negative, and for two reasons—No matter how many years the student remained in college there would be more to learn of engineering science: And much that the engineer needs to know the college or university cannot teach. But in four years the College of Engineering should be able to teach its students, if they have the natural qualifications and have been soundly prepared, how to learn by themselves and so how to profit effectively by the teachings of experience. Is there not some measure of disadvantage in keeping an engineering student engaged exclusively on the study of theory even if the theory is presented in as practical form as is possible in the class-room and laboratory? Is it not true that those who employ young engineers who have had only four years of college environment complain that too many of them are at first more or less disqualified for practical work by having too high an appreciation of, and too great a reliance upon, their college training? The longer they stay in college the more apparent will be this partial disqualification.

I know that I shall here be misunderstood to the effect that I am arguing against college training for the engineer. Nothing could be farther from the truth. I am arguing in favor of a proper balance between the teaching of the college and the teaching of the school of experience; that is, a proper balance between theory and practice.

Also, I am not arguing against post-graduate courses for the few who may be specially qualified for advanced study in theory and research. Though here I believe that many engage in college post-graduate study who would do better out in the world of work. A man is not temperamentally qualified for research simply because he thinks he is. The best graduate school for the

great majority of engineer graduates is the school of experience. In many cases even research can be more advantageously pursued outside the environment of the college, in direct contact with the conditions governing practice. This is shown in the many instances of the fruits of outside research carried back into the college and there taught to the undergraduates, giving them the data so disclosed and helping to impress upon them the value of and necessity for experience teaching.

Why is it that in the face of these facts continually presented to the college instructors, certain of them are so ready to claim a monopoly of all educational agencies?

It can be claimed that the store of experience teaching thus carried back to the college can there best be classified and standardized. To a large extent this is true. But here as in every other such question there are two sides to be considered. Not always is the schoolman qualified to interpret correctly and comprehensively the data thus placed in his hands. Here is where our engineering societies are doing an important work outside of the colleges as well as in coöperation with them and their professors as individuals. In the cause of increased efficiency this all speaks for coöperation, and particularly for an adequate appreciation of the value of coöperation between schoolmen and practicing engineers. To this end the professors of engineering should be encouraged to engage in practice for their own benefit and for the benefit of their students. This coöperation can be further developed by direct interchange of ideas and data between professors and their *former students*, as practiced in some measure in this country, and to a much greater extent, I understand, in some of the German universities.

Are not many of our troubles with respect to education occasioned by the belief on the part of many educators that all education is to be obtained only within the school and college walls? If they do not believe this, do not many of them minimize the educational value of experience in the world of work in con-

tact and competition with one's fellows? Having in mind some of the men we are constantly associating with, it seems absurd to have to remind ourselves that the school of experience teaches many things which the school and college cannot teach, and that this school of experience also may exert a strong cultural influence.

Even if some of the schoolmen are inclined to understimate the educational value of experience teaching, we as engineers must not forget that before the first college of engineering was organized the engineer was busy at his many tasks and the mechanical engineer had produced the steam engine, that most potent progress maker of the ages.

While referring to experience teaching and the insufficiency of the unsupported college training for the engineer, permit me to give a word of advice to the Juniors of our profession. Too frequently young engineer graduates assume the responsibility of acting as consulting engineers before they have had adequate practical experience. A few make the more serious mistake of assuming this great responsibility immediately after graduation, before they have had any practice. The engineer graduate is not an engineer until he is qualified to deal with the practical conditions of his selected specialty. He must be a commercial engineer in the sense that he should regard the money for the investment of which he is more or less responsible, as a sacred trust. It is not for him to risk his employer's money in experiments for which he is not qualified by specific experience.

Still more unfortunately some of these young men set up as general consulting engineers. The saving clause is that they are probably as competent in one engineering specialty as another. No man should attempt the rôle of consulting engineer until he has had a comprehensive practical experience in his specialty. By doing so the offender brings discredit not only upon himself but upon our profession as a whole.

Having said this to the young graduate, permit me to say

a word as to the responsibility of his employer. The young graduate should not be left without guidance in the school of experience. If the employer is an engineer or is competent to direct in the practical things of his specialty, he should see to it that the employee gets every possible opportunity to learn the practical side of the business and to harmonize the theoretical with the practical. Too often the cadet engineer will be difficult to teach and direct because of his unreadiness to believe that he needs this practical experience. Too often he is unwilling to get down to the long hours, dirt and drudgery which may be required to win this practical experience. It is the duty of the employer to provide the means for this, and, failing in success after a fair, patient and intelligent trial, to assist the youngster to a better understanding of what is required of the engineer by giving him his discharge. I know of a number of good men who have been saved by this seemingly severe treatment.

In the treatment of the cadet engineer there rests upon the employer a grave responsibility. Many a young fellow has been unfairly treated because through ignorance, indifference or stupidity the one in authority has expected more than could in reason be demanded. Some employers, not technical graduates themselves, exaggerate the immediate results to be obtained from a college training. Others, college graduates themselves, forget how little they knew of practical things when they graduated, and they think they are comparing the ignorance of the cadet with what they knew when they graduated; but really they are comparing with what they know now after ten, twenty or thirty years of practical experience.

Other cadets have the misfortune to fall under the control of so-called " practical men " who despise " book-learning " and are glad of an opportunity to expose the ignorance of the " college boy." It is the duty of the employer, and especially if he is an engineer, to see that the young graduates taken into his employ are, as far as possible, saved from these harmful influ-

ences—including the conceit of the graduate himself—which work injury to both employer and employed.

From all that I have said as to the opportunities for improvement, let it not be understood that I am condemning the combination of educational agencies which has produced the men who have done so much for this country through its industries. We must realize that the passage of time has wrought of late great changes not only as to the science of engineering, but in a marked degree as to the sociologic and economic conditions within which we must practice, if we are to meet our responsibilities to both capital and labor. A system which *permits* men of more than average ability or determination to qualify for our profession should be so improved through experience teaching as to enable us to turn out from our educational mills a larger percentage of first-class product and to reduce the percentage of rejections. Many a young man who might have given a good account of himself, if he had been better handled at some turning point in his career in college or practice, has failed because he had not yet developed the stamina to resist the forces, negative and positive, which were opposing his progress. It is a source of gratification to me that I have saved some from breaking under the strain of injustice in the college and in the school of experience, and it is a source of regret and humiliation to me that in certain cases, as I can now realize, I failed in my duty in this respect.

In arguing for saner and better balanced educational methods to meet the conditions referred to, conditions of the past as well as of the present, I have no sympathy with those who condemn all our educational theories and methods as obsolete and therefore to be consigned to the scrap heap. Some English engineer, whose name I have forgotten, said that where the United States engineers and industrial managers had a distinct advantage over his countrymen was in their readiness to scrap obsolete apparatus. This " scrapping " process can be like everything else, carried to extremes. We should first de-

termine whether by new combinations the apparently obsolete apparatus or machinery cannot again be made commercially efficient. The inefficient elements only should be replaced. And when it comes to the question of scrapping plant we must determine whether the interest on both the old and the new does not absorb the anticipated savings. I do not hesitate to affirm that in this country, in our enthusiasm for improvement, we have frequently been guilty of wasteful practice in this regard.

This, in a marked degree, applies to much that has been proposed in connection with the scrapping of our educational agencies.

In connection with discussions of industrial questions and the education of the engineer we hear much of the opportunities for increased efficiency. There are such opportunities and there always will be. But we also hear much of conservation, frequently from the same sources. Efficiency of methods should include true conservation; the elimination of the false and defective, but certainly the retention of all that has been proved through experience to be true and useful. With Patrick Henry I say, "I know of no way of judging of the future but by the past." Many of our modern reformers would change this to read, "I know of no way of planning for the future but by disregarding the past."

With the conserving of the good and useful there should be the constant effort to render these still more useful. The older a method or practice, provided it has stood successfully the test of years, the more it is to be prized. Yet we are told by some reformers that because a thing is old, and for that reason alone, it should be scrapped. We are told that because of the marvelous progress made in engineering science in late years, all the teachings of our schools of engineering should be scrapped. We are told that practically all that was taught in these schools twenty-five years ago is now obsolete. Have all the teaching of languages, logic, history, mathematics,

physics, chemistry of the past been rendered valueless because we have advanced in our knowledge of Nature's laws? Apart from more direct arguments we may say that one of the most valuable lines of instruction for the study of engineering is the history of the development of engineering science.

If it is true that all this of the past is valueless, how was it that the men of the past, taught in the schools and outside of the schools, were able to bring about these wonderful advances?

What is the specific function of the College of Engineering? Is it to store the brain with facts, or what the teachers believe at the time to be facts, or is it to train and discipline the brains of the students to think with facility and accuracy along the lines of their future vocations? Many of us who, for the time, have forgotten much of this store of facts without being seriously embarrassed by the loss have our answer to this question. Again let me say that the school and the college cannot complete the training of the engineer; and that these agencies can only prepare the student to learn his profession in the field of practice. Given the personality, it remains for him to develop in the field of practice the initiative for which the formal teaching and drill of the school and college should have prepared him effectively. Included in this preparation should be some teaching of the business side of engineering practice, including the *principles* of accountancy, depreciation, commercial law, patent law, specifications, contracts, analysis of data and the like.

Whatever may be said as to the room for improvements in the agencies, processes and methods employed in the education of the engineer, it should need no argument to demonstrate that the leaders in the profession are as a class those best qualified to advise authoritatively in connection with the efforts to solve many of the most serious problems of the day, involved as these are with questions of transportation, public utilities and the

industries in general. And for the well-being of our country these problems must be solved wisely.

This is an age of reform, and of late years reforms have been so hastily and incompetently put forward as to bring the term reform into reproach. In fact a significant feature of many of our reform movements is the readiness of the leaders to act on impulse and without anything approaching adequate investigation. As has been well said, it seems to be a characteristic of this class of reformers to go too far and too fast.

It is with deep regret that I express the belief that college professors, especially professors of economics, and ministers of the Gospel frequently have been offenders in this regard. I believe that certain professors are being retained in their chairs who should be displaced. Especially in the case of universities this may be due to a tendency on the part of president and trustees to exaggerate the right of free speech. Certainly a professor in a State university, to say nothing of the endowed university, should not be permitted to teach doctrines subversive of law and order and the rights of the individual and property under the Constitution. If these men cannot be controlled by those to whom they are immediately responsible, they should be controlled by those who control the universities.

It is to be borne in mind constantly that good intentions do not qualify one to do expert work, whether that work be in connection with some reform measure or in some other line of public activity. Here is to be found a grave error of which many an honest enthusiast is guilty. The more astute and sordid of the politicians welcome the assistance which they can secure by guiding the enthusiastic and hysterical reformers into lines of activity which will offer opportunities for trading in immunity, obtaining fees for lobbying or securing remunerative employment as the agents of these enthusiasts.

Righteous indignation is to be welcomed—and we had better start out in our reforms with the belief that *as long as the world*

exists there will be full opportunity for righteous indignation. But righteous indignation does not of itself provide a remedy for the evils at which we rebel; it only supplies the desire, and possibly the purpose, to produce a remedy. Righteous indignation and misdirected zeal may produce conditions practically as bad as those which it was purposed to correct or eliminate. Reform should not depend upon hysterical suggestion and fitful support, but should be actuated and maintained by all the forces suggested by experience; it should be constantly and tenaciously, but not vindictively, pursued, acting along the best lines suggested by competent, sane, impartial investigation.

As one of the forces to be reckoned with, and particularly in the industries in which our profession is so vitally interested and for which we must carry such a burden of responsibility, is the tremendous force of ignorance and prejudice constantly being swept in upon us by the tide of immigration. If we hold that our country is to be a haven for the ignorant and oppressed, it is then our duty to provide for the control of the elements of danger we so accept. If we offer a haven to these people so ignorant of our fundamental laws for the protection of life and property, certainly we have the right and it is our duty to demand that at least they shall be subject to those laws. The laws as they stand must bind them as they bind us until amended according to law.

The record of recent happenings shows us that there are very real dangers to be apprehended from this source. We need only to read the reports of the trial at Indianapolis of the men of influence under indictment for dynamite outrages, the record of the Los Angeles dynamite outrage so closely linked with this Indianapolis trial, the trial recently ended at Lawrence of men of like influence indicted for murder through suggestion, the trial of the man who attempted recently to kill an ex-President of the United States, the trials of members of the police force and gangsters of New York, and many other like events

indicating a confidently bold disregard for the rights and the very lives of those opposed to these enemies of law and order, to convince us that popular government is under trial as it never has been before in our history as a people.

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As I have before suggested, the danger does not lie alone with the ignorant and the designing; if that were true, the danger might be met with greater confidence. But we have to see that the enthusiasm of honest but misguided reformers has to be reckoned with, and these people are to be found in our schools, colleges, universities, industrial establishments and counting houses.

Let me quote the words of Schrank who tried recently to assassinate ex-President Roosevelt: "The shot in Milwaukee, which created an echo in all parts of the world, was not a shot at an ex-President, not a shot at the candidate of a so-called Progressive party, not a shot to influence the pending election, not a shot to gain for me notoriety; no, it was simply to once and forever establish the fact that any man who hereafter aspires to a third Presidential term will do so at the risk of his life. If I cannot defend tradition, if I cannot defend the country in case of war, you may as well send every patriot to prison."

This is high-sounding and has a truly familiar ring.

Two of the men on trial at Lawrence made statements which also indicated that they considered themselves champions of the defenseless, apostles of liberty and not of anarchy. These appeals to unreason have a strong influence upon those who are at once ignorant and highly emotional. Unfortunately those who cannot be charged with ignorance in the ordinary sense are led astray by these hysterical appeals to unreason because they appear to reflect a worthy motive.

And yet this man Schrank, who considers himself a hero and martyr and who is able to put his dangerous views thus plainly and strikingly before us, by the unanimous verdict of a num-

ber of competent physicians, has been declared to be a homicidal maniac.

With the conditions at present surrounding us, which I have barely suggested, is it not of the first importance that our public school system should be kept free from teachings which are dangerous to our commonwealth? Should not the system go farther and exercise a positive influence for sane thinking upon the children under its influence during the most impressionable period of their lives? Not only should these pupils be taught directly respect for the rights of others and respect for constitutional government, but above all the aims and methods should be so amended that the thought constantly kept in the minds of teachers and pupils shall be that the pupils are being trained to become self-supporting and so self-respecting units of the body politic. This implies that these boys and girls shall be taught, shall have pressed home upon them constantly, directly and indirectly, that labor of the hands as well as of the brain, if conscientiously performed, is honorable. Undoubtedly there are many schools in the land where high-minded, sane teachers are doing their best to so influence their pupils. Of this my talks with many of them convince me; but I have been at the same time convinced that most of these faithful servants of the people feel that they are working under the disadvantages of a system which too generally fails to dignify the labor required for self-support and to cultivate pride in all work well performed.

A respect for law and order should be inculcated in our public schools by the maintenance of a more intelligent and more exacting discipline. The State has a right to demand and should demand that if a free education is provided for the youth of the country, those so benefited shall render prompt and exact obedience to those in authority. In many cases politics comes in to fetter those who are in immediate authority, and this to the great injury of the pupil, the teacher and the community. Many men and women, now parasites upon society or criminals,

would be self-respecting members of the community if they had been trained to respect honest labor and at least directed to, and given a fundamental preparation for, some vocation.

Let the public schools be conducted for the benefit of the masses and not for the benefit of the very few. The many can be provided for readily and effectively without sacrificing or even hindering those who are qualified by natural endowment to enter college. If some who now go to college were discouraged from so doing, it would be no loss to them or to the community.

Upon us as members of the profession of engineering, individually and collectively, rests the responsibility for doing our utmost to check and correct the evils which I have thus inadequately brought back to your attention. Collectively, and particularly as members of this Society, we are responsible because there are members of our profession who have been at fault as the advocates of hasty and ill-considered measures of so-called reform. Reforms, especially in connection with industrial administration and the relations between capital and labor, which might be inaugurated by our Society or its members after full and candid discussion, should be of decided benefit to the community as well as the profession.

Certainly in the matters connected with public education our profession should be able to advise and direct, for the members of the profession have unsurpassed opportunities to judge of the effectiveness of the work of the schools by the results as evidenced in the product. I am quite aware that some professional educators will not be slow to charge that the engineer is not an expert in the field of education, but to this we may reply that this is not solely an academic question and the results are showing every day that the educators need the coöperation of all who are qualified to assist. And may we not claim that the members of our profession as a class are brought as close to the hearts of the people as are the workers in any other one vocation.

Thus at considerable length, and yet inadequately, I have discussed the opportunities and consequent responsibilities of the engineer of to-day. If we claim, as we should, to be members of a profession, we must accept the responsibilities involved. We cannot claim that our profession is one of the *three* learned professions because the ignorance of the past created a limitation in favor of religion, law and medicine. But we can claim that though much of that which the engineer must have at his command is not to be learned from books, it by no means follows that his education is therefore less "liberal" than that of the minister, lawyer or physician.

There appears to have been a tendency, not so apparent at present, to deny to the Mechanical Engineer the professional position more readily conceded to the Civil and Mining Engineer. This seems unreasonable and indefensible when we study the question and are forced to indorse Holley's claim that Mechanical Engineering underlies all engineering. The reason for this rather intangible discrimination is in part due, I believe, to that fact that so many of the rank and file of our department of engineering are engaged in working out the details, more or less important, of undertakings which are under the general direction of Civil or Mining Engineers or others not members of our profession. Many Mechanical Engineers thus become absorbed in the invention and development of mechanical devices, possibly of vital importance in the general scheme, and so fail to take a grasp on the undertaking as a whole.

The question of precedence need not be raised; there is credit enough for all. As engineers we are committed to the doctrine of efficiency. Efficiency must come from coöperation, not from discussions as to precedence and relative dignity. Watt's steam engine made Cort's rolling mill possible. Cort's rolling mill opened up to Watt's engine a new sphere of usefulness.

The Panama Canal, under the direction of thoroughly capable engineers, was a failure until the bacteriologist, the physician and the sanitarian made it possible for white men to live

in the fever-stricken zone. Now, while under the general direction and control of military and civil engineers, the success of the undertaking largely depends upon the Mechanical and Electrical Engineer.

Then, while confidently asserting our claim to membership among the liberal professions, and accepting to the full the responsibilities which are thereby involved, let us be prompt to recognize that the progress of the world, material and ethical, depends upon the unselfish, intelligent and devoted coöperation in service of all professions and vocations under the leadership of men of vision, intellect, power and humanity.

Note.—In the full text of his address, Dr. Humphreys quotes at length from presidential addresses delivered in past years, to demonstrate that the American Society of Mechanical Engineers, as represented by its presidents, has from the first stood for a broad conception of the duties and responsibilities of the profession.—Editor.

ACADEMIC EFFICIENCY *

By William Kent, M.E., '76

ABOUT ten years ago I was asked by the president and general manager of a large manufacturing corporation to advise him how to improve the performance of his boiler house. During the previous winter it was pushed to its utmost to deliver enough steam to run the engines and to keep the buildings warm, and the next winter, on account of extensions to the factory and increased output, the demand for steam would be still greater. Before beginning my work the president told me something of the history of the company, and of how he came to be the general manager. It had grown in fifty years from a small concern to a large one, occupying several blocks of ground. The business was the manufacture of a variety of shelf hardware. He had for several years been a director and the manager of the sales department, and on the death of the former factory manager the directors insisted on his taking the place, although as he said he knew nothing about running a factory. He started in to learn how by calling in the best outside expert advice available. He was paying $10,000 for a year's services of a highly skilled expert in machinery, jigs, and methods of manufacturing, who was making a revolution in the shop, which amply justified the high price paid for his services. This man said he knew nothing about boilers, and therefore I was called in to tackle the boiler problem. Incidentally the president told me that the catalogue of the products made by the concern contained 14,000 items, each of which involved patterns, jigs, templates, storage, bookkeeping, records and correspondence. Probably half of these items were

* Reprinted from the Bulletin of the Society for the Promotion of Engineering Education, Volume III., No. 2, 1912.

either obsolete or in very small demand, and another large fraction were unprofitable to handle. Another $10,000 might have been properly spent in making a selection of which of the 14,000 items should be abandoned and in printing a new catalogue.

In regard to the boilers, the president told me I could get all information available from two men, the superintendent of the factory and the chief engineer, who were at loggerheads. One had told the president one story about the boilers, and the other an opposite story, and he did not know which one to believe. He called the superintendent into the office to tell me his story, and, dismissing him, called in the engineer who told me the other story. I then had the engineer take me through the whole factory, including the power plant. On my return to the office I told the president that the engineer had told the facts, and that the superintendent had not because he was ignorant; he knew nothing about a power plant and never would know, for his bump of conceit was too great to permit of his learning. I reported further that the trouble from lack of steam was not the fault of the boilers—there were about twenty-five of them, crowding the boiler house to its capacity, and there was no available land for an addition to it—they were making as much steam as they should be called on to make with due regard to economy of fuel; but the trouble was entirely owing to the great waste of steam throughout the factory in winter time. Live steam was used for heating, and numerous traps were wasting both steam and hot water. As a result of my investigation an exhaust-steam heating system was installed, and that stopped all complaints of the insufficient supply of steam.

This long story about a factory may seem to have nothing to do with academic efficiency, but there are several points of resemblance between its condition and that of some educational establishments. They, like it, are suffering from inefficient management continued through a long period of

years; they have too many items in their catalogue; heads of departments at loggerheads; a board of directors who are capitalists, but who know nothing of the details of the business they are supposed to direct; a president and general manager who is well versed in the advertising part of the business, but knows nothing of the best ways of producing its product. The factory, however, has two points of difference from and advantages over the college. (1) The competition of its rivals forces it to improve its methods, while the college has no such stimulus to improvement. (2) The manager of the factory referred to knows that he knows nothing about the best way of running a factory and therefore calls in outside expert assistance, the manager of the college thinks he knows it all, and therefore has no need of advice.

I said some educational establishments, not all. There are others, and this brings me to another story. It is about a university.

A certain large university more than twenty-five years ago had an engineering college that was already suffering from dry rot, although it was only about ten years old. It had a good location, excellent buildings and equipment, and ample funds, yet the college had lost prestige, and the number of students was decreasing. The president of the university knew nothing about engineering education, but he was wise enough not to pretend to know anything about it. He asked half a dozen or more consulting engineers and engineering professors to visit the college and independently to give him written reports as to what ought to be done to improve the college. I was one of the visitors. I found that the college was divided into two independent departments, one theoretical and the other practical, each presided over by a professor who was responsible only to the president. I spent a morning with one of these professors and an afternoon with the other. Each told a tale of woe, about the utter worthlessness and total depravity of the other men. I advised the dismissal of

both, and the appointment of a man who was big enough to be the head of the whole college. Some months were spent by the president of the university in getting these reports and in interviewing different experts, including men whose names had been suggested as qualified for the position. He selected the right man, gave him full authority, approved his every request, and the trustees gave him everything he asked for in the way of competent assistants and additional equipment. The theoretical professor resigned, and the practical one gracefully subsided into a minor subordinate position, where he gave no trouble. The college grew with great rapidity. In ten years it was in the front rank of the engineering colleges of the world, which position it still holds.

Note the points of similarity between the factory and the university as related in these two stories. Each was suffering from inefficient management, each had a president who was ignorant of the details of the business, but who was conscious of his ignorance and was willing to take advice from outside. In each case the advice was taken, with the best possible results.

My subject is entitled Academic Efficiency. I use this short term merely because it has been used before to mean the efficiency of educational methods, and it may be necessary to explain that the word "academic" here means relating to an academy or educational establishment, and not, as it sometimes means, "unreal" or "unpractical." The word efficiency is often used with different meanings. Dr. Eliot, ex-president of Harvard University, in his little book on "Education for Efficiency" defines it as "effective power for work and service during a healthy and active life," and he says "national education will be effective in proportion as it secures in the masses the development of this power and its application in infinitely various forms to the national industries and the national service." The engineer uses a more restricted and technical definition, the quotient of output divided by

input, or the relation or ratio of the result achieved to the effort in obtaining it. Mr. Harrington Emerson objects to this definition as insufficient in its not including an equitable standard of achievement or output as one of its factors, and defines efficiency as the "relation between an equitable standard and an actual achievement," or "the relation between what is and what could be."

Strictly speaking, the engineer's definition is limited to cases in which both the input and the output may be measured in the same unit, or in units that are convertible one into the other, such as foot-pounds and heat-units, but it is a convenient definition for many cases in which neither the whole output nor the whole input are capable of accurate measurement in similar terms. For example,

We spend or give:	We get or gain:
Input.	*Output.*
Time,	Money or saleable goods,
Money or raw material,	Health,
Physical labor,	Recreation,
Mental labor,	Education,
Nervous energy,	Satisfaction.
Health,	
Wear and tear of machinery,	

If we take the engineers' definition expanded in this way so as to include in the input every conceivable kind of expenditure and in the output every conceivable kind of achievement, it will apply to every activity of man. The efficiency while it cannot be stated in figures, as a percentage, is measured by the value of the output in relation to the input or expenditure. Thus a business man may spend every one of the items listed under the head of input, and measured by a money standard the result may show a high efficiency, but measured by a broader standard, in which the result as to health is a negative quantity, it is most inefficient. Then if he takes to playing

golf he may spend time, money and physical labor, and gain health: The efficiency by the money standard is zero, but by the broader standard, including health, recreation and satisfaction, he may consider that the efficiency of the operation is 100 per cent.

A college spends all the items listed under "input." Its efficiency is zero from the money standard, for its business is not to make money, and may be high or low measured in the other items listed under output. By Mr. Emerson's definition, the relation of an equitable standard to the actual achievement, or the relation between what is and what could be, we compare the actual output in health, recreation, education and satisfaction, with what might be realized under the best possible conditions of system and management. Are the results what they ought to be in kind, in quality or in quantity, and if they are not, what are the defects and how can they be remedied?

In the big factory of which the story has been told, the product included 14,000 items, many of which should have been abandoned, and much of the inefficiency was due to the factory's making products that should not have been made. When an efficiency expert begins his operations in a factory his first questions are: What kind of product is made? Why is it made? Why not abandon it if it is not profitable? The same questions might be asked of a college. The next set of questions covers the quality. Is the quality too highly refined and too costly, so that its market is limited? Is it too common and cheap, so that it has to be brought into competition with the poorest goods on the market? Is it out of date and unfashionable? Is the quality what it ought to be, and if not what are the reasons, and how can it be improved? Surely these questions may be asked of a college, and it is the general belief that the answers would not be complimentary to the college. There are serious defects in the quality of the college product.

Next come questions as to quantity. Is the factory turning out too much of one kind of goods, so that the market is glutted and the price too low? Is it turning out too little, so that it is not doing as much business as it might do? Is it turning out too much of one kind and not enough of another; and if so, what changes should be made so as to establish a proper balance? Is the college overcrowding the professions with men who are not needed in them? Is it failing to supply the demand for the kind of men who are needed? The common opinion is that both of these questions must be answered in the affirmative. The last report of the Carnegie Foundation for the Advancement of Teaching says, "In almost every State of the Union there are more colleges in name than the country needs or can afford. They have been started without much regard to the ultimate educational demands—weak and often superfluous colleges. In many cases their existence makes impossible that of good high schools which would far better serve the educational interests of the community."

After these questions of kind, quality, and quantity of product are considered, then comes the question of cost per unit of product and of possible methods of reducing that cost. In the factory the solution of these questions is one of great difficulty and complexity. It includes the items of location, buildings, machinery, system of organization, functional foremanship, statistics, accounting, planning of work, routing it through the shop, methods of payment of wages, keeping high-priced men only on high-priced work and finally time study resolved into its elements, that is motion-study. I quote from Frank B. Gilbreth's new book on Motion Study:

"There is no waste of any kind in the world that equals the waste from needless, ill-directed, and ineffective motions. . . . Tremendous savings are possible in the work of everybody—they are not for one class, they are not for the trades only; they are for the officers, the schools, the colleges, the stores, the

household, and the farms. . . . It is obvious that these improvements must and will come in time. But there is inestimable loss in every hour of delay. The waste of energy of the workers in the industries to-day is pitiful. . . . In the meantime, while we are waiting for the politicians and educators to realize the importance of this subject and to create the bureaus and societies to undertake and complete the work, we need not be idle. There is work in abundance to be done. Motion study must be applied to all the industries. Our trade schools and engineering colleges can:

"1. Observe the best work of the best workers.
"2. Photograph the methods used.
"3. Record the methods used.
"4. Record outputs.
"5. Record costs.
"6. Deduce laws.
"7. Establish laboratories 'for trying out laws.'
"8. Embody laws in instructions.
"9. Publish bulletins.
"10. Coöperate to spread results and to train the rising generation."

Mr. Gilbreth refers to motion-study of the industries that are producing material wealth, but his words may be applied to the industry of educating men and women, that is to the schools and colleges.

The methods of reducing the cost per unit of product in industrial concerns have now been reduced to a science by the management experts, Taylor, Gantt, Emerson, Parkhurst and others. In educational circles only the merest beginning has been made. Bulletin No. 5 of the Carnegie Foundation for the Advancement of Teaching, a quarto pamphlet of 134 pages, entitled "Academic and Industrial Efficiency," contains a report by Morris Llewellyn Cooke of the investigation of the department of physics of eight different colleges or universities. Mr. Cooke has had several years' experience as expert on management of industrial works, and is now Director of Public

Works of the city of Philadelphia. His report is only a preliminary one, and covers little more than a statistical investigation of the cost of instruction in physics per student-hour, and some observations on methods of administration, and on the economical use of buildings and of the time of the professors and instructors, in all of which he found great differences. The total cost of physics per student-hour at Harvard was $1.08 and at Wisconsin $0.60. Of these totals the interest on plant and equipment and administrative expense account is $0.53 at Harvard, and $0.18 at Wisconsin. There are differences in the colleges which are far more important, however, than those that can be expressed in dollars and cents. For example, Mr. Cooke found one in which the professors showed the heartiest interest in the progress of each individual student, and another in which " every time the students were mentioned, there were evidences that the teachers had in mind the students' scholarly inferiority and waywardness."

The cost per student-hour for any subject may be obtained as in Mr. Cooke's investigation. It will be a far larger task to determine the efficiency of the student-hour—that is what return in valuable education the student gets for the expenditure of the thousands of student-hours that he spends in college. We have as yet no standards of measurement by which educational efficiency can be satisfactorily measured, but it cannot be doubted that some day such standards will be found, when well-qualified experts are employed to find them. For a method of obtaining such a standard in English composition, see the writer's paper in *Proceedings of the Society for the Promotion of Engineering Education* in 1907 on " An Experiment in Teaching English to Freshmen in a University."

Efficiency, according to the engineers' definition, is the relation of output to input, or the relation of the result to the effort and cost expended in achieving it. From the college student's standpoint, the input is four years of time and say $2,000 to $4,000 in money. The output is what he receives

for that amount of time and money. Let us put what he receives in tabular form under two heads, life and study.

Life	Acquaintance.
	Companionship.
	Fraternity.
	Social Activity.
	Athletics.
	Reading.
	Leisure.
	Travel.
	Moral Uplift.

Study	Cultural	Disciplinary. Information.
	Technical	Foundations of Science and Art.
	Vocational	Relating directly to life work.
	Curious	Non-useful or dilletante.

How many hours out of the twenty-four in a day are student-hours, and how many are devoted to so-called college life? Is his time properly divided between the activities of life and study? Of the student-hours is there the proper balance between the cultural and the other branches? How and by whom is this balance determined? Which of the courses are prescribed and which are elective, and why? What text-books are used, and why? Are particular courses taught by the text-book and recitation method, by the lecture and note-book method, by the problem method, or by the laboratory method? Is each teacher free to use his own method or is the method determined on by a department head or committee or by other authority? What experimental pedagogical work has been done to discover the relative efficiency of different methods? What are the results of such experiments? Have they been reduced to statistical form and published? What is the administration doing to improve educational efficiency? Is there any method employed to measure the relative efficiency of different teachers, or of the same teacher in different years or when using different methods? How are the tenures of office, promotion, salary, etc., determined? How are poor teachers got rid of or transferred to other positions in which they may be more efficient? What is the organization of the college, and what are the efficiencies of the board of trustees, the president, and

the heads of departments? If an investigator like Mr. Cooke, or preferably a commission of investigators, were to report to the Carnegie Foundation answers to these questions after a year's examination of a dozen or more institutions of learning, it is safe to say that an appalling lack of efficiency would be disclosed. The commission would find every grade of goodness and of badness in the teaching staff, teachers generally overworked, underpaid and dissatisfied and on the lookout for positions elsewhere. It would find self-perpetuating boards of trustees responsible to nobody, individual trustees chosen not for any educational qualification, but solely because they are men of wealth and influence; presidents chosen through personal or political favoritism, whose ideas of education are those of the middle ages, and whose methods of government are those of the tyrant. It would find the conditions mentioned by President Benton, of the University of Vermont, in his inaugural address, 1911, namely, the election of new members of the faculty dependent entirely on the dictum of the president, "the administrative office a veritable cesspool where unpleasant experiences are deposited," "a coterie of professors painfully sycophantic in the presence of their 'lord and master' and bitterly denunciatory of him when left to themselves," "reprehensible hypocrisy by those who teach," etc. President Benton seems to be unaware of the fact that the sycophancy and hypocrisy which he thus bewails are the inevitable results of government by an ignorant despot, and that they can be done away with only by a radical change in the system of government. I do not wish to be understood as believing that the conditions thus described are universal. There are many institutions in which there is no autocratic government, and in which the government approaches in some respect to democratic ideals, where free speech is possible, where merit is recognized and rewarded, and where the teaching methods are constantly being improved. Here and there we find evidences of attempts to find the best methods, and of new experiments in education whose results are

very promising, for example, Professor Franklin's improvement at Lehigh in the method of teaching laboratory physics; the examination of the English teaching in different technical schools by Professor Earle, of Tufts College, the introduction of the preceptorial system at Princeton, Professor Schneider's coöperative system in Cincinnati, the university extension work at Wisconsin, the investigation by a committee of the Society of American Bacteriologists of the teaching of microbiology; and Dr. Rumley's experimental preparatory school at Interlaken, Ind.

Mr. Harrington Emerson has written a book entitled "The Twelve Principles of Efficiency." He wrote it with especial reference to the efficiency of manufacturing establishments, but the principles may be applied to educational institutions. They are the following: (1) Clearly defined ideals. (2) Common sense. (3) Competent counsel. (4) Discipline. (5) The fair deal. (6) Reliable, immediate and exact records. (7) Despatching. (8) Standards and schedules. (9) Standardized conditions. (10) Standardized operations. (11) Written standard practice instructions. (12) Efficiency reward. The investigating committee might use this list of twelve principles of efficiency in its examination of the colleges and find to what extent they are in operation.

Suppose that the Carnegie Foundation were to have an investigation made such as is here suggested, what good would it do? The same good that Mr. Cooke's investigation of the cost of the student-hour did, and something more. It would call public attention to the subject, and might lead some universities to reform some of their methods. It would reveal how bad things are, which is the first step toward reform. The report would be denounced as Mr. Cooke's has been, by college presidents and by editorial writers of conservative ways of thinking, as utterly subversive of all the ancient educational ideals, and involving "a gross and fundamental error." But it would set men thinking. It would show them

that some universities and colleges and some educational methods are better than others, and give the public some knowledge which would enable them to select the best colleges, and some educators of a progressive turn of mind the information they are looking for in regard to methods.

The best possible result of such a report, however, might be that it might induce some multi-millionaire to think that he had a duty to perform in helping to improve the efficiency of educational methods, by contributing the funds that would be required to carry on an educational experiment similar in extent to the experiments carried on by Mr. F. W. Taylor in the Midvale and Bethlehem Steel Works. It required more than twenty years of labor and the expenditure of some hundreds of thousands of dollars to carry on his experiments on tool steel, which have revolutionized machine-shop practice, and on scientific management, which bids fair to cause a far more important revolution in all our industrial systems. Mr. Taylor's system of management cannot be adopted without many modifications by an educational institution, but his system of experimentation can be. It is simply the careful collection of all the facts by an expert, their study by mathematical methods, the making of experiments to get more facts, their further study, and careful reasoning to arrive at correct conclusions. It takes years of time, thousands of dollars of money, and can only be undertaken with any probability of reaching valuable results by a scientific expert who is entirely unhampered by old traditions. The motto of the conservative is "whatever is, is right," that of the scientific expert is, "whatever is, is apt to be wrong; I am going to test it and find out whether it is right or wrong."

Here is the outline of an educational experiment to take ten years of time and cost half a million of dollars—less money by the way than one second-class university has spent on its equipment for athletics within a few years, and less than has been paid by some millionaires for a couple of paintings.

Appoint a commission of five well-educated men who are not connected with any educational institution, say a minister, a doctor, a farmer, a merchant and an engineer, to secure a wide diversity in points of view. Pay them $5,000 a year each for the first year, and a smaller sum in succeeding years, when their time will not be fully occupied, and provide them with an office, stenographer and clerk, and funds for traveling expenses. Let them spend a preliminary year in investigating actual educational conditions in this country, collecting facts, statistics and expert opinions, on which they should prepare a report. They should also report their opinion on what should be the course of education of a boy between the ages of fourteen and sixteen, if he intends to go to work in the mechanical trades or in commerce at the age of sixteen, also what should be the course from fourteen to eighteen (1) if he intends to go to work at eighteen, (2) if he intends to enter a general college, (3) if he intends to enter a technical school. The second year the experiment is to be begun. Select a hundred boys who are ready to enter high school, of the majority of whom there is a reasonable probability that they will, if they prove fitted for it at eighteen, take a college course. Rent a preparatory school, or a portion of one, and have the boys taught, by selected teachers, in the courses laid down by the commission. Provide enough tutors or preceptors to insure that the education of the boys is properly supervised and that their time is not wasted. Continue their high school education, for as many of them as stay in school, for four years. During all their time the commissioners are to be studying methods of teaching, and methods of measuring the efficiency of teaching, preparing practical standards of examination, not merely to test the memory of the scholars, as in ordinary examinations, but to test their mental and bodily powers. Find out not only what the boys know, as a mere act of memory, but what and how they think, and what they can actually do. Test not only the hundred boys, or as many of them as remain, but also boys

in other high schools, by the same standards or by other standards that may be proposed by the high school teachers. Cultivate the same spirit of emulation for success in scholarship that now exists for success in the athletic field, but give them also enough athletics and other recreation to develop their bodies as well as their minds. Train them also in hygiene, in morals and in manners, to make them not only scholars but gentlemen.

During these four years the commissioners are also studying college administration, courses, methods of teaching, and efficiency, and determining standards of measurement of efficiency. When the boys are through their preparatory course of four years, send them to such colleges as have been selected for them, have them take the courses for which they are fitted, provide tutors for them, and watch their progress through the college, testing them by predetermined standards in comparison with other college students. At the end of the four-year college courses, the commission is to report on the whole eight years' experiment. It will be found that many mistakes have been made, but probably not so many as would be made in an ordinary eight-year course of high school and college. The success of the experiment is not to be judged by the success of these selected boys, but by the value of the information obtained and reported on by the commissioners as to the various methods of teaching and of college administration and by the acquirement of standards by which academic efficiency may be measured in the future.

During the whole of the eight years' experiment the boys should be required to keep a diary in which they record what seem to be the most important items concerning their education, and they should once a year present to the commissioners a written report of their progress, keeping a copy for their own future use. Four years after they have graduated from college, when their minds are sufficiently mature, they should be asked to write critical reports of their educational career

as it then appears to them. A study of these reports by the commission, which should be continued in existence for that purpose, would no doubt furnish fruitful ideas for further educational progress.

Cecil Rhodes did a noble work in establishing the foundation of the Rhodes Scholarship in Oxford. Andrew Carnegie has done a grand work in establishing the Carnegie Institute for Scientific Research and for the Advancement of Teaching. Equally grand will be the work of him who shall establish a foundation for the application of the methods of scientific management to the improvement of academic efficiency.

This proposed plan is merely a suggestion. There may be a better plan, but whatever it may be it will take years of hard work and a large sum of money to accomplish the desired results. It might be undertaken by the Carnegie Foundation for the Advancement of Teaching, by the Russell Sage Foundation, or by the government, but the funds of these foundations are probably already fully employed, and judging by the past non-activity of the government in educational matters it might take twenty years of agitation before Congress could be induced to make the necessary appropriation. The government has a Department of Agriculture which is making experiments for the farmer, to enable him to grow larger and better crops, a bureau of forestry which is trying to conserve our forests, a bureau of mines which is experimenting on improving the methods of mining and on the prevention of accidents. It has also a bureau of education, which publishes statistics of schools and colleges and some interesting papers on educational subjects, but which has never investigated academic efficiency or carried on an educational experiment. All educational reforms in this country have been originated by individual philanthropists or by individual universities. They do not come about by normal process of evolution in the educational world or by governmental action, with perhaps a single exception, the Morrill

Land Grant Act of 1862, fifty years ago. We therefore must look for a millionaire philanthropist to begin the great educational experiment which will lead to improving the methods of training our future citizens.

Our modern educational literature, addresses of college presidents and school superintendents, proceedings of societies, etc., all show the prevailing consensus of opinion that there is something seriously wrong with our whole educational system, and that instead of getting better it is constantly tending to grow worse. There exists also a great amount of ultra-conservatism and of mental inertia relating to the subject. It is high time that something practical be done in the way of reform.

STUDY OF THE RELATIVE MERITS OF THE VARIOUS TYPES OF ELECTRIC ARC AND INCANDESCENT LAMPS FOR LIGHTING URBAN AND SUBURBAN STREETS *

By Harold H. C. Lasker, M.E., '12

THE importance of street lighting was first realized during the mediæval ages. With the infestation of the roads by thieves and highwaymen it became necessary to have a means of marking the way by night. The primitive method of accomplishing this end took the form of lanterns and torches.

The dim and flickering lighting thus obtained was improved during the seventeenth century when public lighting concerns were given franchises to light the streets. It was not until the eighteenth century that street lighting was undertaken at public expense.

The purpose of street lighting up to this time was to prevent crime. It was strictly a measure for public safety. As the legitimate use of streets by night increased, the necessity of more lights became apparent. The growth of cities made it essential to have illuminants of higher efficiency.

With the introduction of the automobile during the nineteenth century and the increasing establishment of business thoroughfares in large cities, street lighting at the present day is called upon to serve more purposes than one. It is not only an adjunct to the police force, but it must help prevent accidents, beautify the city, and also contribute toward increasing business.

Electricity was first applied to street lighting during the early part of the nineteenth century. Sir Humphrey Davy invented the first voltaic arc in 1809. Although a crude affair,

* This essay was awarded the Stillman Prize of Applied Technology.

it marked the birth of the electric light. The electric arc was first introduced as a practical source of light in 1844 by Foucault and began then to be considered for street lighting. An incandescent lamp was invented by Grove in 1840. It was not until 1880 that this type was introduced into actual practice.

The problem of efficient street lighting implies the production of satisfactory illumination at the least cost of operation. The many attempts which have been made to solve this problem mark the development of various types of electric arc and incandescent lamps.

The illumination of any light source is determined by a study of its intensity and distribution.

The intensity of illumination is the relative amount of luminous energy and is generally expressed in candle power. The candle power of a lamp is obtained by photometric means; the values obtained at various angles in a vertical plane passing through the light source determine the " intensity " or " distribution curve " of the lamp. Such a curve is shown in Fig. 1.

The distribution of the light over the surface of the street depends upon the height and spacing of the lamps. The distribution is measured in foot candles, a foot candle being defined as " the normal illumination produced by one unit of candle power at a distance of one foot."

If the intensity of the light source in candle power be I, the distance in feet between the light source and any point P on the street surface be S, the acute angle between the ray S and the vertical be A, the normal illumination at P in foot candles is

$$i_n = \frac{I}{S^2};$$

the horizontal illumination at P is then

$$i_h = \frac{I}{S^2} \cos A.$$

The distribution should be made as uniform as possible; when it is not uniform the change in intensity should not be too rapid, since the eye is then not able to distinguish objects clearly.

Artificial illumination is primarily a physiological proposition. It is therefore necessary to study the quality as well as the quantity of light. An important consideration is that of glare.

Glare is caused by the use of lamps having high intrinsic brilliancy. The undiffused light striking the retina of the eye produces much discomfort. The iris of the eye tends to keep the brilliancy of the light striking the retina at a constant value. Glare therefore has the effect of fatiguing the eye, the pupil becoming so contracted that the eye is strained trying to distinguish objects in the shadow. To avoid glare, the lamps should be kept out of the line of vision; another remedy is to use diffusing globes or reflectors.

The color of the light should be as nearly white as possible. The light should also be steady.

The three factors entering into the cost of operation of street lamps are (a) fixed charges, (b) maintenance charges, and (c) energy charge.

The fixed charges include interest (generally 6%) on capital invested, taxes, insurance, and depreciation. The depreciation charge is generally about 10%, which when placed in a sinking fund at 5% will replace the equipment in eight or nine years. The replacement is due to obsolescence rather than physical decay. The depreciation charge is also governed by the life of the city ordinance.

Maintenance charges include cost of renewals, breakage of glassware, repairs to the mechanism of the lamp, charge for labor in trimming, cleaning of glassware and reflectors, inspection, and store room charges.

Energy charge is based on the kilowatt hours consumed. For convenience of comparison the cost of energy is taken at

the lamp terminals. The energy charge covers the cost of delivering this power, including depreciation and maintenance of station equipment, poles, and wires.

There are various methods of basing the cost of operation, these schemes being called schedules. The two schedules in common use are (a) the "all night and every night schedule" in which the lamp is assumed to burn 4,000 hours per year, and (b) "the moonlight schedule" in which the lamps do not burn on moonlight nights, this being equivalent to burning 2,500 hours per year. The former scheme is used in large cities and the latter in small cities and suburban districts.

The greater the number of hours that a lamp burns per year the less is the importance of the fixed charge. The shorter the schedule the more important is the fixed charge and the less important are the energy and maintenance charges.

There are two systems of electrical distribution—the series and the multiple. Either direct or alternating current can be used on these systems.

In the series system apparatus is provided at the station to keep the current constant for each circuit of lamps; the voltage across the arc is kept constant by the feeding mechanism of the lamp which regulates the arc length.

In the multiple system a standard voltage of 110 volts has been adopted, incandescent lamps generally being operated on this system. Since arc lamps require less voltage, resistance is used in series with the arc in multiple arc lamps to limit the current to the proper value.

Alternating current arc lamps are not as efficient light producers as direct current arc lamps. The scheme now used quite extensively is to generate alternating current and to transmit it to the mercury arc rectifier. The latter converts the alternating current to direct current which passes to the direct current lamps. This is more economical than using direct current arc light generators. The rectifier makes it possible for any type of lamp to be operated with fair efficiency and con-

tinuity of service from alternating current constant potential generators.

The series system is used more than the multiple on account of the larger and more expensive conductors required for the multiple system. "Current for each group of lamps may be carried over a rather small size of conductor without regard to the number of lamps in circuit if they are all connected in series."

The "mean horizontal candle power" of a lamp is the average intensity of light in a horizontal plane passing through the lamp. The "mean spherical candle power" (m.s.c.p.) is the average candle power taken over the surface of a sphere having its center at the light source. The "mean hemispherical candle power" (m.h.s.c.p.) is the average candle power taken over the surface of the *lower* hemisphere whose center is the light source.

The total flux of light from a lamp is 4π times its mean spherical candle power; the unit of flux is the lumen. The efficiency of light production is the mean spherical candle power per watt (for incandescent lamps) of the mean hemispherical candle power per watt (for arc lamps). The specific consumption of a lamp is the reciprocal of the efficiency and is sometimes spoken of erroneously as the efficiency.

The various arc lamps used for street lighting are types of the carbon arc and the flame or luminous arc.

The two types of carbon arc lamps are (a) the open arc and (b) the enclosed arc.

The open arc lamp was the most generally used arc light up to the late nineties. It is not employed extensively in this country, but is abroad, where carbons of the highest grade and careful laborers may be cheaply had.

There are two styles of open arc lamps. One operates at 9.6 amperes and the other at 6.6 amperes, both using 50 volts at the arc. The power used by the lamps is 480 and 330 watts respectively.

The 9.6 ampere lamp is called the "full arc" and has been classified as a "2,000 candle power" lamp. This lamp gives a maximum candle power at an angle of 45 degrees, this value being 1,200 candle power; its mean hemispherical candle power is 600.

The 6.6 ampere lamp is called the "half arc" and is classified as a "1,200 candle power" lamp. Its true maximum candle power is at an angle of 45 degrees and equals 700; its mean hemispherical candle power is 350.

The open arc lamp can be operated on alternating or direct current. When alternating current is used, each carbon becomes alternately positive and negative. The reversals of current must be sufficiently rapid so that the arc will not be extinguished. This necessitates a frequency of at least 40 cycles per second, but 60 is generally used.

The open arc in common use to-day operates at 9.6 amperes and 50 volts on direct current. The distribution curve of this lamp is shown in Fig. 1.

The mean hemispherical candle power of this lamp is 600. Its efficiency is 1.25 m.h.s.c.p. per watt. The life of its electrodes is 17 hours and that of the outer globe is 1,000 hours. The cost of the lamp is $15.*

The annual fixed charge is $2.40, the maintenance charge per 4,000 hours is $21.70 and the cost of energy per 4,000 hours (at one cent per kilowatt hour) is $19.20. The total annual cost is therefore $43.30.

The variation of light due to flickering and feeding is large in the open arc lamp. The electrodes are consumed rapidly; this means trimming each day, entailing expense in labor and material.

The light given off by this lamp is bluish white in color. Although the efficiency of light production of this type is ex-

* Cost data obtained from Bulletin No. 51, Engineering Experiment Station, University of Illinois.

cellent, its distribution is not as good as that obtained with the enclosed type. The operating cost of the open arc is greater than that of the enclosed arc. The enclosed arc lamp has therefore superseded the open type in this country.

In this type of arc lamp, the electrodes are enclosed in a refractory inner globe which is slightly opalescent. The arc is thus contained in a space which is nearly airtight. The electrodes are consumed very slowly, their life being as long as 100 hours, or six times that of the open arc. Enclosing the electrodes also has the effect of improving the steadiness, but better electrodes are needed than for the open type.

The direct current enclosed arc lamp takes from 3 to 7 amperes. The usual sizes are 5 and 6.6 ampere lamps operating at 72 volts. The mean hemispherical candle power of the 6.6 ampere lamp is 360. The power consumed is 475 watts, the efficiency being therefore 0.76 m.h.s.c.p. per watt.

Poor results are obtained when low current density is used in the arc. The 5 ampere lamp gives only 239 m.h.s.c.p. at a wattage of 1.6 per candle power, the corresponding efficiency being 0.62 m.h.s.c.p. per watt.

In the alternating current enclosed arc lamp the light flux is symmetrical about a horizontal plane. A reflector must therefore be used above the alternating current arc to turn the upward light down to the useful lower hemisphere. The maximum light of such a lamp is nearer the horizontal than in the open arc or the direct current enclosed arc, its distribution is therefore excellent for great distances.

The alternating current lamp is inferior to the direct current type in that the latter on account of the refractory inner globe gives a much better distribution of the light.

The following table gives the relative costs of the 6.6 ampere D. C., 7.5 ampere A. C., and the 6.6 ampere A. C. enclosed arc lamps.

	6.6 amp. D. C.	7.5 amp. A. C.	6.6 amp. A. C.
Cost of lamp	$34.50	$20.00	$20.00
Annual fixed charge	5.52	3.20	3.20
" maintenance charge	9.08	7.76	7.48
" energy charge	21.68	19.20	17.00
Total annual operating cost	36.28	30.16	27.68

The development during the past few years in street lighting has been in the direction of securing more light from the arc stream of the carbon arc. This is accomplished by the flame arc (or the luminous arc).

The flame arc is of three general types. One has mineralized carbons converging to an acute angle; another is known as the Blondel lamp and has vertical electrodes; the third type has vertical electrodes, one of which is impregnated with metallic oxides, commonly oxides of iron and titanium. These three types give high candle power and are well adapted for large units.

The inclined carbon type throws most of its light directly downward, and must therefore be placed specially high with respect to the spacing. It gives a steady arc and is a very satisfactory illuminant. The arc takes 10 amperes and operates at about 55 volts. The mean hemispherical candle power is 1,785, the efficiency being 3.24 m.h.s.c.p. per watt, which is very high.

The inclined carbon flame arc is used with both direct and alternating current. The life of the electrodes of this type is 17 hours. The cost of the lamp is $60.

The cost of operation is as follows:

	A. C. Lamp	D. C. Lamp
Annual fixed charge	$ 9.60	$ 9.60
" maintenance charge	53.08	55.08
" energy charge	18.68	25.00
Total operating cost	81.36	89.68

The vertical Blondel type of flame arc gives a wider distribution of the light than the inclined electrodes. This type is more efficient for street lighting than the inclined carbon type; it takes 5.5 amperes at 43 volts. The specific consumption is as low as 0.26 watts per m.h.s.c.p. for the direct current type and 0.24 watts per m.h.s.c.p. for the alternating current type.

This type is known as a long burning flame arc, the life of its electrodes being 70 hours for the direct current lamp and 100 hours for the alternating current lamp. The cost of this lamp is $60.

The cost of operation is as follows:

	A. C. Lamp	D. C. Lamp
Annual fixed charge	$ 9.60	$ 9.60
" maintenance charge	22.56	29.80
" energy charge	14.00	17.60
Total annual operating cost	46.16	57.00

The present high cost of mineralized carbons and their rapid consumption has checked the progress of both the inclined and vertical electrode flame arcs. The color of the light is objectionable, being yellow. The intrinsic brilliancy is often too high in such lamps.

The life of the electrodes in this flame arc may be increased by enclosing the arc. It is then known as the "regenerative arc." In this lamp the vapors from the impregnated electrodes are carried down and reintroduced into the arc chambers, increasing the luminous efficiency of the flame.

The third class of flame arcs is known as the luminous arc. The best example of this class and the one extensively used is the magnetite lamp.

Most of the light in this arc is produced by the oxide of

titanium. The lower or negative electrode is an iron tube into which ground magnetite, titanium oxide and chromite are packed. The upper electrode is generally copper. The mag-

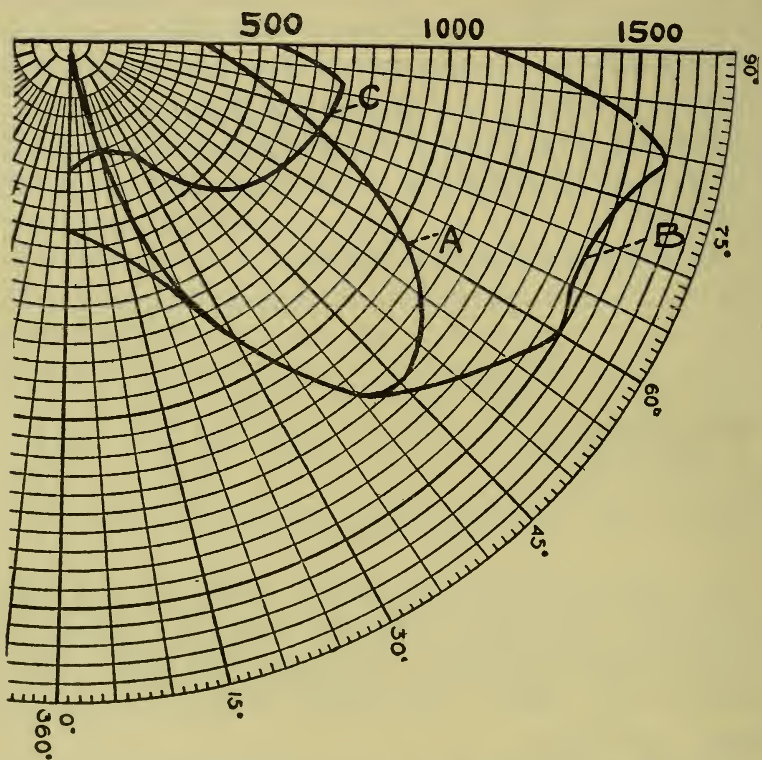

Fig. 1.—*Distribution Curves of Arc Lamps with Clear Outer Globes.*

A. 9.6 Amperes, D. C. Open Arc.
B. 6.6 Amperes, D. C. Magnetite Arc.
C. 4 Amperes, D. C. Magnetite Arc.

netite melts, volatilizes, and carries with it the titanium; the function of the chromite is to absorb the fluid magnetite and steady the arc.

The distinction which must be made between the flame arc and the luminous arc is that in the former the conductor of the current is not the light-giving material, whereas in the luminous arc the light-giving material is the vapor conductor.

The electrodes in ordinary flame arc lamps are consumed very rapidly. Long electrodes (14 to 18 inches) in these lamps do not last more than 10 to 17 hours. The magnetite electrodes, however, last from 85 to 200 hours.

The light distribution of the magnetite lamp makes it an excellent lamp for street lighting. The intensity is low directly beneath the lamp and high at angles a little below the horizontal.

There are two types of magnetite lamps operating on 6.6 amperes and 4 amperes respectively, at a voltage of 80. The mean hemispherical candle power of the former is 1,170 and that of the latter 457. The 6.6 ampere lamp has an efficiency of 2.22 m.h.s.c.p. per watt and the 4 ampere lamp has an efficiency of 1.43 m.h.s.c.p. per watt. Fig. 1 gives the "distribution curve" for this lamp.

The magnetite arc can easily be substituted for the carbon arc lamp, since it is operated with the same generators. The same amount of power is supplied but more than double the total illumination is produced by means of magnetite lamps.

The cost of the magnetite lamp is $60.

The operating cost is as follows:

	6.6. Ampere D. C.	4 Ampere D. C.
Annual fixed charge	$ 6.40	$ 6.40
" maintenance charge	12.12	8.96
" energy charge	24.20	14.60
Total annual cost of operation	42.72	29.96

A comparison of the efficiencies and total costs of operation of the various arc lamps is given in the following table:

	Efficiency m. h. s. c. p. per Watt	Annual Cost of Operation
9.6 ampere open arc, D. C.	1.25	$43.30
6.6 " enclosed arc, D. C.	0.76	36.28
7.5 " enclosed arc, A. C.	0.62	30.16
6.6 " enclosed arc, A. C.	0.59	27.68
10.0 " flame arc (inclined), D. C.	3.24	89.68
10.0 " " " " A. C.	1.83	81.36
5.5 " " " (vertical), D. C.	3.85	57.00
5.5 " " " " A. C.	4.18	46.16
4.0 " magnetite, D. C.	1.43	29.96
6.6 " " D. C.	2.22	42.72

Fig. 2 shows the relation of the horizontal distribution of the various types of arc lamps.

In the incandescent lamp, the light is produced by a fine filament heated to incandescence by a current of electricity. The filament is in a vacuum to prevent rapid oxidation and conduction. The efficiency of the incandescent lamp depends on the temperature of the filament; its life, however, is decreased by rise of temperature.

As a result of quite recent improvements, filaments of more refractory material are now used in incandescent lamps. These can be worked at higher temperatures and consequently higher efficiencies without materially sacrificing the life of the lamp.

The distribution of light from an incandescent lamp depends on the form of the filament; other things being equal, the total light flux remains constant.

The common incandescent lamps for street lighting are (a) the carbon filament lamp, (b) the metallized filament or "Gem" lamp, (c) the tantalum lamp, and (d) the tungsten lamp.

The earliest incandescent lamp was the carbon filament type.

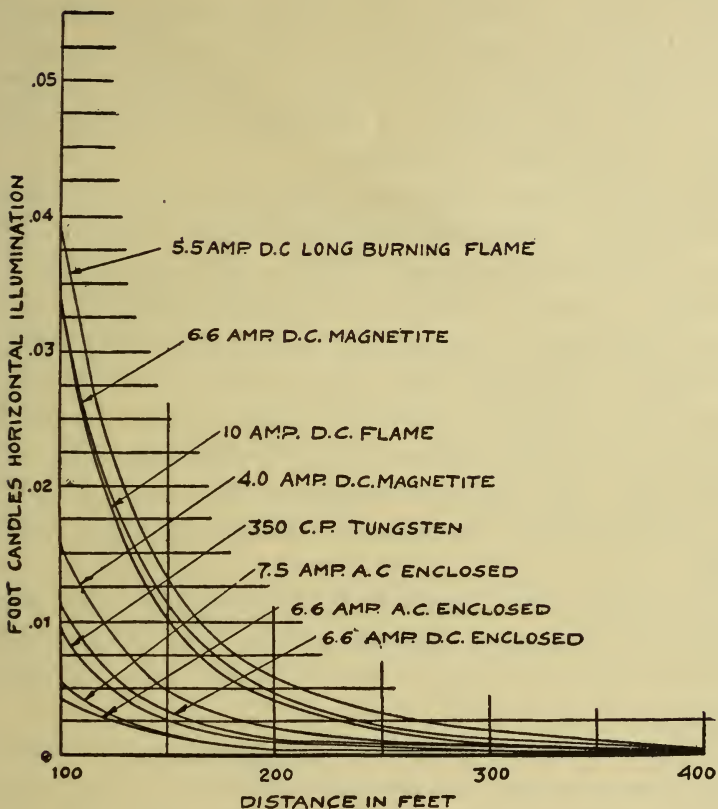

Fig. 2.—*Comparison of Horizontal Distribution at Street Surface by Different Lamps.*

It required 5 to 6 watts per candle; improvements in the manufacture of the filament resulted in a lamp having specific consumption of 3.1 watts per candle power.

The common 16 candle power carbon filament lamp gives a mean spherical candle power of 13.2. It operates on 110 volts taking a current of 0.45 amperes: It consumes a power of 50 watts. The efficiency of this lamp is 0.264 m.s.c.p. per watt. Its life is 450 to 500 hours.

The annual energy charge (for 4,000 hours) for the carbon filament lamp, at one cent per kilowatt hour, is $5.60. The annual maintenance charge is $1.97. The fixed charge is about $1, so that the total cost of operation is $8.57.*

The metallizing or graphitizing process for treating carbon filaments was developed about 1905. The type of lamp employing this filament is called the "Gem" lamp. It can be operated at a higher efficiency than the ordinary carbon filament lamp. The specific consumption of this lamp is 2.5 watts per candle; its life is the same as the 3.1 watt per candle carbon type.

The "Gem" lamp, especially in small units, has given good results in series street lighting circuits. The ordinary sizes take 1.75, 3.0, 3.5, and 5.5 amperes; they give a horizontal candle power of from 20 to 50.

The 20 candle power "Gem" lamp gives a mean spherical candle power of 16.5. It takes 0.45 amperes at 110 volts and has an efficiency of 0.33 m.s.c.p. per watt. The life of this lamp is about 450 hours.

The annual energy cost of this lamp (at one cent per kilowatt hour) is $4.32. The annual maintenance charge is $2.21. Fixed charge being $1; the total operating cost of this lamp is $7.53.*

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* Municipal Engineering, April, 1910.

The tantalum lamp employs as its filament a metal resembling antimony having a melting point higher than that of platinum. The life of this type of lamp is about 900 hours on direct current and 500 hours on alternating current circuits.

The 20 candle power tantalum lamp gives a mean hemispherical candle power of 16. It takes 0.36 amperes at 110 volts and gives an efficiency of 0.4 m.s.c.p. per watt.

The maintenance cost per 4,000 hours for the direct current lamp is $2.20 and for the alternating current lamp $4.* The direct current type is much more efficient and economical.

The tungsten lamp was produced in 1905. The filament is made of a metal resembling chromium.

This type is well adapted for high current, low voltage series lamp for use on constant current circuits for street lighting. It operates successfully on direct and alternating current.

The tungsten lamp is the most efficient metal filament lamp. Its color is white and its intrinsic brilliancy high. The lamp should hang vertically so as to give a better distribution; a longer life is also effected by this position of the lamp. Owing to the high intrinsic brilliancy the lamp should be enclosed by a bowl type reflector; the part of the lamp which projects below should be frosted.

Both the tungsten and the tantalum lamp show less variation in candle power with fluctuations in voltage than the carbon filament lamp.

Tungsten lamps with horizontal candle power ranging from 32 to 350 are used for street lighting. They all have a specific consumption of 1.18 watts per mean horizontal candle power and a life of 1,350 hours.

Fig. 3 gives the "distribution curves" for a 200 candle power tungsten lamp.

* Municipal Engineering, April, 1910.

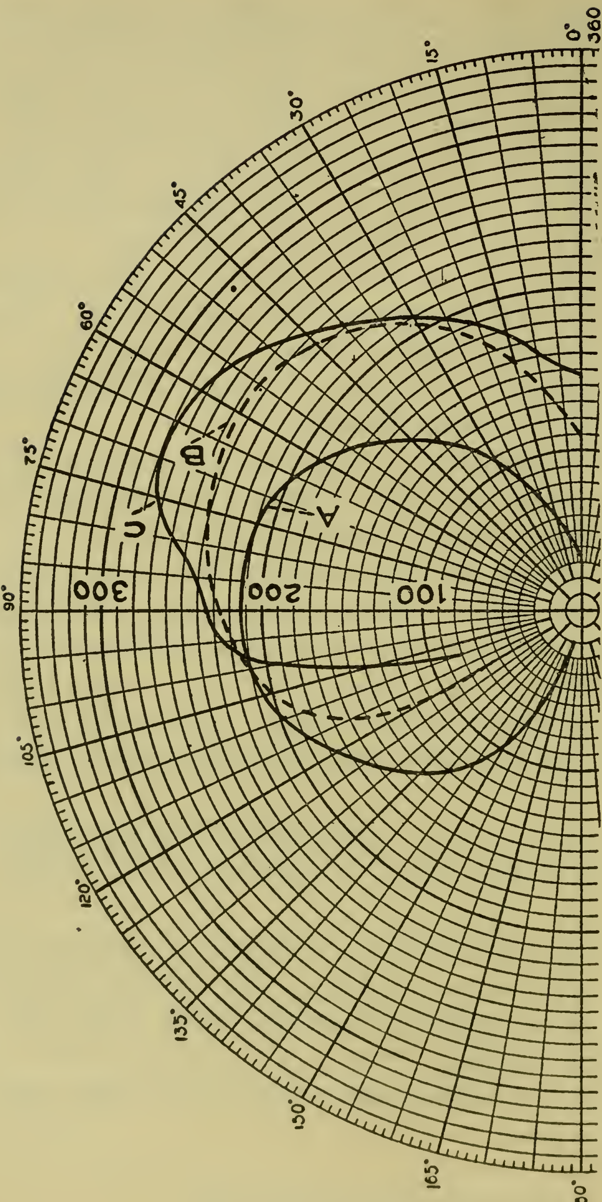


FIG. 3.—*Distribution Curve for 200-Candle Power Series Tungsten Lamp.*

A. Bare Lamp.
B. Lamp with 22-inch Enameled Reflector.
C. Same with Radial Wave Reflector.

The following table * gives the cost and operating characteristics of tungsten lamps suspended at the side of the street.

Horizontal candle power	32	60	100	200	350
Terminal watts	38	71	118	236	413
Watts per mean horizontal candle power	1.18	1.18	1.18	1.18	1.18
Mean hemispherical candle power (with reflectors)	43	80	135	227	471
Watts per m. h. s. c. p.	1.04	1.04	1.04	1.04	1.04
Maximum candle power	45	84	140	280	490
Fixed charge	$1.36	$1.36	$1.39	$1.59	$1.79
Maintanance charge	3.56	3.56	3.92	7.80	11.80
Energy charge	1.52	2.84	4.72	9.44	16.52
Total cost of operation	6.44	7.76	10.03	18.83	30.11

A comparison of the operating costs of the incandescent lamps considered shows that the saving in favor of the 32 candle power tungsten over the carbon filament lamp is $2.13 per year; the saving over the "Gem" lamp is $1.09.

The specific consumption of the tungsten lamp is 1.18 watts per mean horizontal candle power as against 3.1 for the carbon lamp and 2.4 for the "Gem" lamp.

The intensity and distribution of illumination for the tungsten lamp far exceeds that of other incandescent lamps. The efficiency of the various tungsten lamps is very high.

The purposes which street lighting must serve depends largely upon the location of the lamp.

Urban streets may be divided into three classes: (a) principal streets, (b) important cross streets and boulevards, and (c) residential streets.

The illumination of business streets must be brilliant. It should be uniform and of sufficient intensity (at least 0.25 to 1 foot candle) to enable a person to read ordinary size print.

In European cities the inclined carbon flame arc is used to some extent for this purpose. The lamps are suspended over the center of the street at a height of about 40 feet and are spaced at about 200 feet. The effect produced is pleasant and

* Bulletin No. 51. Engineering Experiment Station, University of Illinois.

the street is brightly illuminated. With the reflection from the buildings the illumination averages about 2 foot candles.

In this country much interest is being taken by the merchants in the illumination of business streets. In many cities, "downtown lighting associations" have been formed by the merchants to assist the city in meeting the cost of maintenance; they are successfully bringing about more effective and artistic street lighting.

As a result of the interest manifested by the merchants many of the large cities of this country are installing large units, consisting either of magnetite lamps or of four and five-lamp clusters of tungsten lights on ornamental poles.

A prominent example of ornamental and efficient lighting of business streets is that of New Haven, Connecticut. The type of unit used is a single magnetite lamp mounted on a beautiful iron pole. The lamp is 14.5 feet above the sidewalk; the poles are placed on both sides of the street and staggered so as to be alternately spaced at 44 feet. The average illumination in the center of the street is 2.05 foot candles. The illumination is much more efficient than where 500 watt tungstens are used. The illumination from the magnetite lamp at 65 feet is equal to that of a 5 lamp tungsten cluster at 35 feet. The cost to the merchant of this lighting system is 11 cents per foot store front per month.*

A five 100 watt tungsten cluster produces 400 candle power per column, while a magnetite lamp consuming the same power (500 watts) produces 1,000 candle power.

The magnetite arc used in New Haven is enclosed by an opal globe which corrects the glare. The lamp mechanism is contained within the pole, the casing being part of the ornamental design.

The illumination on boulevards and cross streets need not be very brilliant. The type of lighting required on cross streets depends on whether the street has shade trees or not. When

* Electrical World, April 20, 1912.

the street is shaded, the light should be suspended low unless the streets are very wide. Where there are no shade trees, high intensity lamps suspended high or low intensity lamps hung low and spaced closely should be used.

Boulevards are generally shaded. The lamps should therefore be suspended at the sides of the street instead of over the center, so that the drivers of rapidly moving vehicles should not be blinded. The intensity of illumination should be from 0.1 to 0.5 foot candles. For this class of street, tungstens and enclosed arc lamps are used.

The chief requirement for residential streets is that a lamp should be placed at each street crossing for the safety of vehicles and pedestrians.

Since this class of streets is generally shaded by trees, the lamps should not be more than 25 feet above the street surface. The character and color of the street surface affects the lighting of such streets. A snow-covered street, for example, appears much better lighted than one with no snow on it. Macadamized or asphalt pavement needs more illumination than one paved with light bricks.

The illumination in the immediate neighborhood of most arc lamps is higher than necessary for this class of street. The type of lamp which seems best adapted to residential streets is the incandescent lamp.

The tungsten lamp giving a white and brilliant light and high intensity, placed high and far apart, has rapidly replaced the dim and closely spaced carbon filament lamp for this purpose.

The intensity of illumination of suburban streets need not be high. The lower candle-power tungsten lamps find efficient application to this class of street lighting. Such lamps should be spaced closely, and supported low so as not to be obstructed by foliage.

Arc lights having a low cost of operation are also used. It is often the case that a community cannot afford to have an arc

light at each street intersection in a suburban district. Tungstens are then used to advantage.

An aspect which presents itself in suburban street lighting is the effect of silhouetting. This is a method of discernment of an object by the contrast between the dark object and a light background.

An arc light of high intensity is placed at distant intervals and illuminates only a portion of the street on account of the shading trees. A vehicle passing through the street is not seen by means of incident light, but the form of the vehicle is seen against the light background furnished by the light at the other end of the street. The lighter the background, the better the effect. Sometimes the lamps are situated at intervals as great as one quarter of a mile. The distance of the street surface background from the observer is immaterial, provided the illumination is substantially bright.

In this case, the intensity of the illumination is the criterion; the distribution is of little moment.

A pedestrian whose clothing reflects the same light as that reflected by the street surface can be discerned much better by this silhouette effect than by means of incident light from the lamp. The amount of illumination required varies in accordance with the locality. To determine the most desirable method of illumination, therefore, the local conditions must be taken into consideration.

The arc lamp finds its application chiefly in urban streets where a high degree of illumination is required. The tendency in urban street lighting now is to do away with the enclosed arc lamp of relatively small candle power and low efficiency and to substitute the arc lamps of higher candle power, such as the magnetite lamp.

In suburban districts, where the amount of light required is not so high, the series incandescent lamp proves very satisfactory. The tungsten lamp is the type which gives the best results in this field of illumination.

OBITUARY

MAUNSEL WHITE

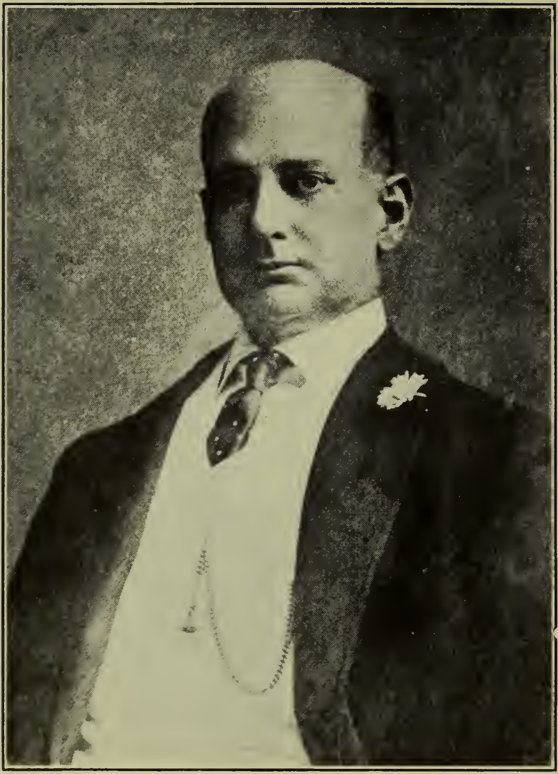
STEVENS lost one of her most notable Alumni in the death of Maunsel White, who died at the home of his brother-in-law, Edwin W. Rodd, in New Orleans on October 22, 1912. Mr. White was 56 years old. He had been troubled by ill health, so that he gave up work in the North some eight years ago.

He was born on his father's plantation, Deer Range, situated in Plaquemines Parish on the Mississippi River about forty miles below the city of New Orleans, on March 15, 1856. He was a nephew of Chief Justice White of the United States Supreme Court, and his maternal grandmother was the sister of Jefferson Davis, President of the Confederate States.

After receiving his early education from private tutors at his father's home, he entered Georgetown University. Deciding upon an engineering career, he entered the School of Technology, at Worcester, Mass., and after graduation there entered the workshops of the Lehigh Valley Railroad, at Weatherby, Pa. Realizing the need for higher technical education after the practical knowledge of mechanics thus gained, he entered Stevens Institute of Technology, and graduated in the Class of 1876 with honors, being valedictorian of the class.

He was then engaged by the Bethlehem Iron & Steel Company, where his ability soon won him high rank. Probably his best known work was the development, with Frederick W. Taylor, of the Taylor-White process for hardening tool steel, which was revolutionary in character, in many cases doubling and trebling the output of metal cutting machines.

Mr. White was in charge of the Bethlehem Company's exhibit at the World's Fair in Chicago in 1893, and also at the Paris



MAUNSEL WHITE

Exposition in 1900. He was personally presented with a bronze medal of merit by the administration of the Paris Fair for the excellence of the exhibition he had planned. As representative of his company, he frequently visited Europe, negotiating the sale of armor-plate to foreign governments, particularly that of Russia. He was a life member of the American Society of Mechanical Engineers, and a member of the Iron and Steel Institute (British), and the American Institute of Mining Engineers.

OBITUARY

CHESTER EDMONDS BRADLEY

Chester Edmonds Bradley was born on January 9, 1883, at Jersey City, N. J. He was educated in the public schools of that city until his thirteenth year, when he entered the Stevens School, at Hoboken, graduating there in 1899. He entered the freshman class at Stevens in the autumn of that year and graduated in 1903.

During his college course he stood well in his class, was a member of the Mu Chapter of the Chi Phi Fraternity and was prominent in all activities connected with the college. He played on his class lacrosse team in his freshman and sophomore years, acting as captain in his sophomore year, and played on his class football team in the same years. He played on the varsity football team in his freshman year, but after that gave more of his attention to lacrosse, playing on the varsity lacrosse team in his sophomore, junior and senior years.

He graduated well up in his class and took a position with the Astoria Light, Heat & Power Company, at Astoria, L. I., remaining with this company until he left to accept a position with the Standard Oil Company at the Bayonne Works. Here he remained until 1908, when he took a post-graduate course in mining engineering at the Columbia School of Mines. He completed two years' work in one year, but in so doing suffered a breakdown in health from which he never fully recovered. After completing the course he traveled over the United States for some months, and then took a position with the Public Service Corporation in Jersey City, but was obliged to leave this position on account of ill health, and after a prolonged illness at his home in Jersey City died there on October 29, 1912.

During his college course he was universally popular, and his loss will be keenly felt by all who have had the privilege of knowing him.

The following resolutions have been adopted by the Class of 1903:

Whereas, It has pleased the Almighty God to take unto himself our friend and classmate, Chester Edmonds Bradley; and

Whereas, We of the Class of Nineteen Hundred and Three have lost in him a classmate whose noble and lovable character won for him our respect and sincerest friendship, and whose death has caused us deep sorrow; be it therefore

Resolved, That these resolutions which shall be preserved in the Annals of the Class, and a copy of which shall be placed in The Stevens Indicator, express our deep grief at his loss; and be it also

Resolved, That a copy of these resolutions be tendered his bereaved family as a token of our sincere sympathy for them in this time of their sorrow.

J. V. B. Duer,
W. J. Bray,
F. Rabbe, Jr.,
Committee.

SAMUEL TENNEY MUDGE

Samuel Tenney Mudge, '06, died of diabetes at his home in South Manchester, Connecticut, on September 8, 1912. It was only devotion to his little family, and keen interest in his business to the end, that enabled him to fight powerfully against his growing weakness the last year, and to live as long as he did.

Mr. Mudge was born on February 22, 1884, in Brooklyn, the son of Alfred Eugene and Mary Gilbert Ten Broeck Mudge. His father was a prominent lawyer who was at one time Corporation Counsel for the old City of Brooklyn. He received his early education at the Polytechnic Preparatory School, and the Boys' High School of Brooklyn, where he attended for

four years. He then entered Stevens Institute and was graduated in 1906. While at the Institute he took an active part in athletics, playing on the 'varsity football team for three years. He was also very much interested in photography and took a large number of pictures of classes, athletic teams, etc., especially during his last two years at the Institute.

Upon graduation Mr. Mudge entered the service of the American Sugar Refining Company in Jersey City. After two years with that company, he went to the University of Michigan and taught machine designing for two years. He then accepted a position as General Manager and Superintendent of the two mills of the Rogers Paper Manufacturing Company, South Manchester, Connecticut. In two years, mainly by his energy and ability, the output of the plant was more than doubled and the floor area increased seventy per cent.

He was a Junior Member of the American Society of Mechanical Engineers and formerly a member of the University Club of Brooklyn.

In September, 1907, Mr. Mudge married Marion W. Cudlipp, a sister of Charles W. Cudlipp, '06.

Besides his widow, he leaves a son, Robert S. Mudge. He is also survived by a brother, Alfred E., and two sisters, Isadore G. and Clara D. Mudge.

The Class of 1906, through a committee, have sent a letter to Mrs. Mudge, expressing the deep sorrow felt at the loss of a sincere friend, who by his genial, manly and unselfish character endeared himself to every man in the class.

STEVENS THEATRE PARTY

Stevens Alumni and their friends to the number of a thousand thronged the boxes, orchestra and first balcony at the New Amsterdam Theatre on the evening of December 6, 1912, on the occasion of the first annual theatre party of the Stevens Alumni Association. The affair was planned as a benefit to swell the somewhat depleted funds of the Association's treasury, and more than $900 was realized, in addition to the flood of pleasant memories that the audience carried away from the theatre at the close of the performance.

The attraction was "The Count of Luxembourg," one of the reigning successes of the musical comedy variety of the New York season. The company was capable, the lines bright, and the music catching. The Cardinal and Gray of Stevens and the national colors were blended effectively in special decorations of the theatre, while from the boxes hung the banners of many of the classes.

In the fifteen-minute intermission between the acts, President E. H. Peabody, '90, made a graceful speech before the curtain, in which he thanked those who by their support had made the evening such a success, both socially and financially. He pointed out many of the notable Alumni occupying boxes or orchestra chairs, and called for a Stevens cheer for President Humphreys, which was given with a will. B. Franklin Hart, Jr., '87, chairman of the committee, then led the audience in singing "A Song for Old Stevens" and "Alma Mater," to the accompaniment of the full orchestra of the theatre.

When the curtain had been rung down after the last encore, the audience dispersed to nearby dispensaries of nourishment and good cheer. No advance announcement had been made of any particular meeting point.

The evening was such an unqualified success that it will be made an annual fixture, the social end rather than the financial being emphasized in the future, and the seat prices fixed correspondingly. It has been suggested that this year the gallery be chartered also, and the undergraduates given an opportunity to attend in a body at cost.

The committee in charge consisted of B. Franklin Hart, Jr., *chairman;* W. D. Hoxie, A. Siegele, Jr., Thomas C. Stephens and E. O. Heyworth.

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EDITORIAL COMMENT

A Decade of Development

The tenth anniversary of Dr. Humphreys' administration as President of Stevens marks one of the most important decades in the life of the college. It has been a period of constructive advance and betterment, in reality of transition. Justifiable expansion along lines carefully planned with an eye to future growth has taken place, and no one connected with Stevens has been more urgent of the necessity for such expansion or more keen to take advantage of opportunities for it than President Humphreys.

Among the incidents of his administration which stand out most boldly may be mentioned the erection of the Morton Memorial Laboratory of Chemistry, the acquisition of Castle Point Field and surrounding ground for campus purposes, and, most important of all, the saving of Castle Stevens to the college for all time. These are material advances, but perhaps more significant are the intangible betterments to be found in the spirit of coöperation between undergraduates and Faculty, crystalliz-

ing in the self-government system by which engineering students are for the first time given large control over discipline in and out of examination time, and the growth of a truer college spirit and alumni spirit. Of course there have been other contributing causes, but Dr. Humphreys has stood behind it all with wise direction, and has overcome financial obstacles and some still harder to conquer raised by a misinformed public opinion.

At their annual dinner the Alumni will give some evidence of their appreciation of his work and will endeavor to reinforce his oft-expressed view, that no college president is backed by a more loyal body of graduates.

Publicity and Stevens Alumni

With this issue the INDICATOR comes under new management. For a proportion of the Alumni which is unfortunately large because of geographical reasons, the quarterly is the principal source of news of Stevens and its graduates. The men who are able to reach New York for the annual dinners or Castle Point Field for Alumni Day learn much by direct contact with other Alumni, but there are hundreds for whom this pilgrimage must be infrequent. To them the INDICATOR hopes to carry adequate news of the college, the Alumni Association, and their fellow Alumni, but it can do so only with the best of coöperation. No one editor or board of editors can hope to canvass the entire Alumni field. The INDICATOR must therefore rely largely upon the Alumni themselves to send to it that news of Stevens men and their achievements which one best likes to read of his old acquaintances.

There is a very definite publicity campaign in progress, which must be based on facts to be successful. If every graduate will feel it his personal duty to send to the INDICATOR news concerning himself or his Stevens friends, trivial though it may seem to him, he will be forming the basis for a quarterly of more interest to himself and for a better knowledge of Stevens

among others who should be intimate with the college and its Alumni.

The INDICATOR belongs to the Alumni, and in the same degree that they coöperate in its management will it be successful.

ALUMNI DIRECTORY

ALUMNI ASSOCIATION OFFICIALS

President....................................ERNEST H. PEABODY, '90
First Vice-President....................................J. H. CUNTZ, '87
Second Vice-President..............................J. ALFRED DIXON, '91
Secretary....................................THOMAS C. STEPHENS, '00
Treasurer....................................LOUIS A. MARTIN, JR., '00

Directors: Term Expires 1913—R. H. RICE, '85; W. D. HOXIE, '89; F. A. MUSCHENHEIM, '91; W. E. S. STRONG, '92. Term Expires 1914—F. J. GUBELMAN, '89; H. E. GRISWOLD, '93; R. C. POST, '98; R. W. PRYOR, JR., '02.

Trustees: HOSEA WEBSTER, '82; E. H. PEABODY, '90; J. ALFRED DIXON, '91; WALTER KIDDE, '97; R. W. PRYOR, JR., '02.

Alumni Trustees: HOSEA WEBSTER, '82; WALTER KIDDE, '97; JOHN W. LIEB, JR., '80.

Stevens Institute Alumni Association (European Branch)—LAFAYETTE D. CARROLL, '84, *Acting Secretary.*

Stevens Club of Newark—W. R. HALLIDAY, '02, *Secretary.*

Stevens Club of Brooklyn—WILLIAM E. PAULSON, '04, *Secretary.*

Southern Alumni Club—A. M. MORRIS, '07, *Secretary.*

Stevens Club of Philadelphia—J. B. KLUMPP, '94, *Secretary-Treasurer.*

Stevens Club of Schenectady—RICHARD H. MARVIN, '03, *Secretary-Treasurer.*

Wisconsin Stevens Club—CORNELIUS T. MYERS, '00, *Secretary.*

Western Stevens Club—A. K. HAMILTON, '95, *Secretary.*

Stevens Club of Pittsburgh—E. A. CONDIT, JR., '02, *Secretary-Treasurer.*

New England Stevens Club—F. M. GIBSON, '01, *President.*

CLASS REPRESENTATIVES

'73.—J. A. Henderson, 120 North 19th St., Philadelphia, Pa.
'74.—H. W. Post, Box 415, Mountain Lakes, Boonton, N. J.
'75.—S. D. Graydon, Stevens Institute, Hoboken, N. J.
'76.—A. Riesenberger, Stevens Institute, Hoboken, N. J.
'77.—F. E. Idell, 50 Church St., New York City.
'78.—W. R. Baird, 271 Broadway, New York City.
'79.—John S. Cooke, 364 Broadway, Paterson, N. J.
'80.—J. W. Lieb, Jr., 55 Duane St., New York City.
'81—R. M. Dixon, 2 Rector St., New York City.
'82.—Hosea Webster, 85 Liberty St., New York City.
'83.—F. C. Fraentzel, 804 Broad St., Newark, N. J.
'84.—W. L. Lyall, 439 Aycrigg Ave., Passaic, N. J.
'85.—A. W. Burchard, 30 Church St., New York City.
'86.—F. A. LaPointe, 63 Eighth St., Hoboken, N. J.
'87.—J. D. Flack, "Orienta," 302 West 79th St., New York City.
'88.—Richard Beyer, 902 Hudson St., Hoboken, N. J.
'89.—F. J. Gubelman, 47 West 34th St., New York City.
'90.—E. H. Peabody, 85 Liberty St., New York City.
'91.—C. G. Atwater, 17 Battery Place, New York City.
'92.—W. O. Ludlow, 12 West 31st St., New York City.
'93.—E. D. Lewis, 185 Madison Ave., New York City.
'94.—G. B. Fielder, Cartaret Trust Co., Sip Ave., Jersey City, N. J.
'95.—A. F. Ganz, Stevens Institute, Hoboken, N J.
'96.—W. H. MacGregor, 165 Broadway, New York City.
'97.—J. M. Towne, 54 Walnut St., East Orange, N. J.
'98.—Robert Boettger, United Piece Dye Works, Lodi, Bergen Co., N. J.
'99.—J. S. Henry, Safety Car Htg. & Ltg. Co., 2 Rector St., New York City.
'00.—H. L. Underhill, Consolidated Gas Co., 501 East 21st St., New York City.
'01.—A. Siegele, Jr., 167 Lenox Road, Flatbush, Brooklyn, N. Y.
'02.—L. K. Lydecker, 2 Rector St., New York City.
'03.—S. H. Lott, Stevens Institute, Hoboken, N. J.
'04.—C. E. Hedden, Stevens Institute, Hoboken, N. J.
'05.—I. R. Lewis, c/o Walter Kidde, 140 Cedar St., New York City.
'06.—L. A. Hazeltine, Stevens Institute, Hoboken, N. J.
'07.—Peter Minck, Kilbourne & Jacobs Mfg. Co., 25 Broad St., New York City.
'08.—G. D. Thayer, 24 Monticello Ave., Jersey City, N. J.
'09.—G. E. Terwilliger, 1 Liberty St., New York City.
'10.—Nelson Ogden, New London Ship & Engine Co., Groton, Conn.
'11.—S. J. Bell, Babcock & Wilcox Co., Bayonne, N. J.

NEWS OF STEVENS MEN

1881

R. M. Dixon has been appointed to succeed John Aspinwall as Class Representative.

1883

Frank A. Magee died on January 2, 1913. A more extended notice will appear in a later issue.

1884

John A. Bensel was reëlected State Engineer and Surveyor of New York at the general election in November. His plurality exceeded 188,000 votes. Mr. Bensel ran on the Democratic ticket.

The Scientific American of December 14, 1912, contains an illustrated article upon the gasoline motor-driven automatic cream separator manufactured by the Standard Separator Company, of Milwaukee, Wis., of which Alvin P. Kletzsch is treasurer and director. It is asserted that this separator can skim faster than ten men can milk, having a capacity of more than 700 pounds an hour.

1890

Stevens men appear to be in demand when the commonwealth wishes to get a particularly intelligent jury. Henry Morton Brinckerhoff was a member of the jury which recently convicted Charles Hazen Hyde, former Chamberlain of New York City. C. T. Cooley, '01, it will be remembered, served on the jury that convicted Police Lieutenant Charles Becker.

Ernest H. Peabody will deliver a lecture on "Developments in Oil Burning" before the post-graduate students at the United States Naval Academy, at Annapolis, on February 11, 1913.

1892

Edward L. Jones, Assistant Professor of Mechanical Engineering, Lehigh University, South Bethlehem, Pa., died on October 18, 1912.

1896

Since the reorganization of the Standard Oil Company, following the decision of the United States Supreme Court in the Government's suit against the corporation, Douglas S. Bushnell has been made president of the New York Transit Company, with headquarters at 26 Broadway, New York City.

NEWS OF STEVENS MEN

1897

While crossing Thirty-second Street, near Broadway, New York, on December 7, 1912, Joseph M. Towne was struck by an automobile, suffering a fractured skull. He was on his way to meet his fiancé, Miss J. Louise Dodd, at the Imperial Hotel. W. O. Ludlow, '92, fortunately happened to be passing by. He accompanied Mr. Towne to the New York Hospital, where the latter, in spite of his serious injury, so rapidly convalesced, that he was later removed to his home.

Running on an independent ticket for Mayor of Montclair, N. J., Walter Kidde was defeated at the November election by the regular Republican candidate, who was unopposed by any candidate of the Democratic Party. Mr. Kidde has for some time been serving as a Councilman in Montclair.

1898

Millidge Penderell Walker was married to Miss Eleanor Mary Landis, daughter of the Rev. and Mrs. Henry Mohr Landis, at Trinity Cathedral, Tokyo, on December 26, 1912. Mr. Walker is professor of mathematics at St. John's University, Shanghai, China.

1900

Prof. Louis A. Martin, Jr., has been elected a member of the American Society of Mechanical Engineers.

C. K. Brackett is now with the Western Electric Company, 463 West Street, New York City.

R. D. Brooks is connected with the H. R. Worthington Company, 115 Broadway, New York City.

1901

F. I. Reese is with the Trion Manufacturing Company, Trion, Ga.

1903

Charles J. Roeser is Division Engineer with the Public Service Gas Company, at Hackensack, N. J.

Henry W. Johnson has left the Providence Engineering Works and is now Mechanical Superintendent of the Bullard Machine Tool Company, Bridgeport, Conn.

F. Rabbe, Jr., is now with Joseph Garry & Son, Contractors, New York City. His address for mail is 3476 Broadway, New York City.

Edward A. Quigg, who has been in the estimating works of the Illinois Steel Company, at Chicago, is now designing structural work with the Hay Foundry and Iron Works, Newark, N. J.

1904

H. B. Gaylord is with Taylor-Wharton Iron and Steel Company, 100 Broadway, New York City.

H. Irwin Westervelt, who was formerly with the Indiana Pipe Line Company, is now in the employ of the Erie Railroad, at 30 Church Street, New York City.

1905

Richard A. Schaaf and Miss Vivian H. Zauner, of New Rochelle, N. Y., were married on November 26, 1912.

1907

R. F. Cruickshank's address is now Big Indian, Ulster Co., N. Y.

Herman Helms is with the Aluminum Company of America, North American Building, Philadelphia, Pa.

Erwin C. Meyer has accepted the position of Engineer at the Detroit Plant of the Parish Manufacturing Company, manufacturers of pressed steel parts and automobile frames. His address for mail is Parish Manufacturing Company, 1666 Mt. Elliott Avenue, Detroit, Mich.

1908

Charles C. Phelps, '08, has accepted a position with the Edison Storage Battery Company, Orange, N. J. His new work will be in connection with the publicity matters of this concern. The engagement of Mr. Phelps to Miss Louise Noble, of Weehawken, N. J., was recently announced.

On October 29, 1912, Charles W. A. Steinmetz was married to Miss Kathrine F. Martin, of Hoboken.

Floyd R. Stewart was married to Miss Florence Bates, of Meadville, Pa., on October 26, 1912. Mr. Stewart occupies the position of Assistant General Foreman of the Erie Railroad in Jersey City.

J. L. Moss, Jr., is in the Engineering Department of the Simplex Automobile Company, New Brunswick, N. J.

C. W. A. Steinmetz is in the Heating and Ventilating Department, F. M. Andrews & Co., 1 Madison Avenue, New York. His home address is 48 Hauxhurst Avenue, Weehawken, N. J.

Arthur V. Farr and Miss Edna Elizabeth Martin, of Hoboken, were married on October 30.

1909

The engagement of John H. Peper, Jr., to Miss Mabel Brauckmuller, of Brooklyn, was recently announced.

E. R. Carter, Jr., is in the Engineering Department of the New York Telephone Company, 25 Church Street, New York City.

Bertram A. Appleton is Sales Engineer for the Hemming Manufacturing Company, manufacturers of heat resisting insulation, Garfield, N. J.

K. A. Herrmann's address is Hudson Court, corner Grant Avenue and Boulevard, Jersey City, N. J.

Henry Landesmann is located with the Concealed Transom Lift Company, 437 Fifth Avenue, New York City.

J. G. Drinkwater is in the U. S. Reclamation Service, with headquarters at Helena, Mont. His address is The Montana Club, Helena, Mont.

Percy L. Cobb has changed his address to 444 Ross Avenue, Wilkinsburg, Pa.

Charles F. Beckwith is with Paul Beardsley & Co., Bankers, 141 Broadway, New York City. His present home address is 35 Mt. Vernon Avenue, Orange, N. J.

Edward Fortmann is Engineer with the New York Transit Company, and is located at Binghamton, N. Y.

Winthrop Otis Hearsey was married to Miss Louise Capen, daughter of Mrs. Nelly Capen Taylor, at Los Angeles, on September 17, 1912. Mr. and Mrs. Hearsey are now living at 1739 West Twenty-fifth Street, Los Angeles.

The engagement is announced of Charles A. Stewart, Jr., to Miss Marjorie Hawkins, of Brooklyn, N. Y.

A. F. Wright is assistant superintendent of the American Button Company and the Wright Manufacturing Company, at 70 Morris Avenue, Newark, N. J.

Seth X. Metzger, *ex*-'09, is assistant superintendent of the steel works of the Crucible Steel Company of America, at Harrison, N. J.

John A. Kreitler was married to Miss Leonora Katherine Smith on October 14, 1912, at the home of the parents of the bride, Mr. and Mrs. Leonard M. Smith, 48 Camp Street, Newark, N. J. Mr. and Mrs. Kreitler are now residing at 8 Shanley Avenue, Newark.

A. A. Williamson, formerly with the American Telephone and Telegraph Company, in New York City, has been transferred to a more responsible position in the New Haven, Conn., offices of the same company.

1910

J. C. Robertson, Jr., is with the Robbins Conveying Belt Company, Park Row Building, New York City. His home address is 36 South Maple Avenue, East Orange, N. J.

E. T. P. Greenidge is Engineer with the Indiana Pipe Line Company, with headquarters at Huntington, Ind.

Arthur P. Roscoe has been appointed to the position of Junior Engineer with the Public Service Commission for the First District, New York. He is located with the 6th Division, Part II, at 565 Fifth Avenue, Brooklyn, the work at present consisting of the Fourth Avenue Subway extension from 40th Street to 90th Street.

1911

J. L. Myers is in the Production Department of the Northway Motor and Manufacturing Company, Detroit, Mich. His mailing address is Box 708, Y. M. C. A. Building, Detroit, Mich.

C. W. MacMullen is with the International Motor Company, in their Mack Works at Allentown, Pa.

Charles G. Macdonald is in the Taylor Stoker Department of the American Engineering Company, at Philadelphia, Pa. His mailing address is Delta Tau Delta House, Castle Point, Hoboken, N. J.

A. R. Lawrence recently won the 6¼ mile cross-country run held by the Yonkers Y. M. C. A., to select men for the Metropolitan Cross-Country Team. He started with a handicap of three and one-half minutes and made an actual time of 26 minutes 26 seconds; the time of the nearest competitor was 33 minutes 19 seconds.

Eugene S. Quackenbush has changed his address to 157 West 105th Street, New York City.

W. H. Koch has accepted a position with the A. & F. Brown Company, Elizabethport, N. J.

Armin S. Hoffman has accepted a position with the Lowell Gas Light Company, of Lowell, Mass.

1912

Harold C. Noe is now in the employ of the Packard Motor Car Company as a motor erector. His address for mail is 1449 Mt. Elliott Avenue, Detroit, Mich.

S. F. Bonnet is a cadet engineer in the Construction Department of the United Gas Improvement Company, Broad and Arch Streets, Philadelphia, Pa.

G. H. Fullerton is with Rice, Barton & Fales M. & I. Company, Worcester, Mass., in their engineering department.

W. E. Marshall has changed his address to Grand Street, Maspeth, L. I.

Walter F. Dombrowsky has left Post & McCord, and is now with the Babcock & Wilcox Company, of Bayonne, N. J.

Roy C. Whitall has accepted a position with the Mexican Eagle Oil Company, Tampico, Mexico.

Harry W. Stortz has accepted a position with the Western Electric Company, 463 West Street, New York City.

George L. Clouser is in the Motive Power Department of the Chicago, St. Paul, Minneapolis & Omaha Railway, at Minneapolis, Minn.

ALUMNI NEWS

CHANGES IN MANAGEMENT

Following the resignation of Charles C. Phelps, '08, as Secretary of the Alumni Association, Manager of Castle Stevens, and Editor of the Indicator, three new appointments have been made to fill the vacancies. As announced in the last issue of the Indicator, Mr. Phelps found the combined burden too severe for one man to carry, and withdrew after more than a year of efficient service.

The Executive Committee of the Alumni Association appointed Thomas C. Stephens, '00, Secretary for the unexpired portion of Mr. Phelps's term. Mr. Stephens generously offered to take up the somewhat onerous routine work of the Association, waiving the salary that has been paid in the past, and has entered enthusiastically into his new duties.

To manage the Castle, the college authorities named S. H. Lott, '03, instructor in the Department of Descriptive Geometry and Mechanical Drawing. Mr. Lott has taken up his residence at the Castle, and will combine the supervision of its affairs with his duties upon the Faculty.

As Managing Editor of the Indicator, the Executive Committee of the Alumni Association selected Gerald E. Terwilliger, '09, who was editor-in-chief of *The Link* and of *The Stute* while an undergraduate, and who has had other journalistic experience.

EXECUTIVE COMMITTEE MEETINGS

A meeting of the Executive Committee of the Stevens Alumni Association was held at the University Club, New York City, on Wednesday, November 13, 1912. The meeting was called to order at 12.30 p.m. by President E. H. Peabody. The other members present were: R. H. Rice, J. H. Cuntz, F. J. Gubelman, J. A. Dixon, F. A. Muschenheim, H. E. Griswold, Walter Kidde, R. C. Post, L. A. Martin, Jr., R. W. Pryor, Jr., and C. C. Phelps. The following past presidents attended: Dr. A. C. Humphreys, William Kent, R. S. Kursheedt, and C. J. Field. T. C. Stephens, '00, and G. E. Terwilliger, '09, were also present by invitation.

The minutes of the previous meeting were read and approved.

F. J. Gubelman reported for the Publicity Committee and J. A. Dixon for the Committee on Increase of Membership. F. A. Muschenheim reported for the Auditing Committee. R. C. Post rendered the Alumni Day Report, which was accepted with the thanks of the Executive Committee.

On behalf of the Theatre Party Committee it was reported that the show would occur on Friday, December 6, and the play would be "The Count of Luxembourg" at the New Amsterdam Theatre. The entire house, excepting top gallery, was contracted for, making 1,244 seats in all to be sold.

Mr. Peabody brought up the matter of the resignations of C. C. Phelps as Editor of The Indicator and Secretary of the Alumni Association, and announced that G. E. Terwilliger, '09, was considering the editorship of The Indicator, and that T. C. Stephens, '00, was willing to accept the secretaryship for the remainder of the unexpired term, without salary.

The title of the Alumni Editor of The Indicator was changed to "Managing Editor."

H. E. Griswold moved that the resignations of C. C. Phelps, as Secretary and Editor, be accepted with regret and with the thanks of the Executive Committee for the good work he has done for the Association. Mr. Cuntz seconded the motion and it was carried unanimously.

H. E. Griswold moved the appointment of G. E. Terwilliger as Managing Editor of The Indicator. This was seconded by J. A. Dixon and carried.

H. E. Griswold moved the appointment of T. C. Stephens to serve as Secretary of the Alumni Association, without salary, until the expiration of the unexpired term. After being seconded by R. C. Post it was carried.

A meeting of the Executive Committee of the Alumni Association of Stevens Institute of Technology was held at Castle Stevens, Hoboken, on Tuesday, December 10, 1912. The meeting was called to order at 8.15 P.M. by President E. H. Peabody. The other members present were: J. H. Cuntz, F. J. Gubelman, J. A. Dixon, Walter Kidde, Prof. L. A. Martin, Jr., and T. C. Stephens. Dr. Alexander C. Humphreys, R. S. Kursheedt and George Dinkel, past presidents of the association, and G. E. Terwilliger, managing editor of the Indicator, also attended.

The minutes of the previous meeting of November 13, 1912, were read and approved. J. A. Dixon reported for the Committee on Increase of Membership and presented the names of the following men for reinstatement to active membership:

Frank A. LaPointe, '86	R. Hartley Cranmer, '08
W. O. Barnes, '84	A. P. Hager, '02
Charles W. Thomas, '84	William E. Paulson, '04
F. H. Sawyer, '97	Charles P. Hidden, '97
Thomas R. Parker, '01	C. E. Baldwin, '06
Edward C. Sofio, '98	N. S. Hill, Jr., '92

It was moved to present at the Mid-Winter Meeting of the Association for election to associate membership the names of the following men:

Alexander T. Moore, '82	Charles T. Ziegler, '91

Reporting for the Publicity Committee, Mr. Gubelman suggested that the various clubs secretaries, besides sending in news, should also see that the same be published in the papers of their respective localities. He made other recommendations for the acquisition and dissemination of news relating to Stevens, as did also Dr. Humphreys, Mr. Kidde and Mr. Terwilliger.

Mr. Peabody announced that Mr. Hart, chairman of the Theatre Party Committee, had informed him that the net proceeds of Stevens Night amounted to between $900 and $1,000, the complete report not being ready. A vote of thanks was unanimously extended to Mr. Hart for his valued services in this regard.

It was ordered that the Association should pay, for the office of the Secretary, $125 toward the services of a stenographer, to be shared by the Castle Management, the Editor of the Indicator and the Secretary.

TRUSTEES OF THE ALUMNI ASSOCIATION MEET

At a meeting of the Trustees of the Alumni Association, held December 10, 1912, at Castle Stevens, at which were present E. H. Peabody, J. A. Dixon and Walter Kidde, the proceedings of the Executive Committee meetings held April 3, 1912, May 24, 1912, July 2, 1912, September 11, 1912, October 9, 1912, and November 13, 1912, and the Annual Meeting of the Alumni Association of May 31, 1912, were ratified.

BROOKLYN CLUB DINNER

At a dinner of the Stevens Club of Brooklyn at the University Club of Brooklyn on November 23, 1912, David C. Johnson, '06, was reëlected president, and W. E. Paulson, '04, was elected secretary. The following Stevens men were present:

Dr. Alexander C. Humphreys, '81
B. W. Finkensieper, '09
Frank W. Foster, '84
Frederic R. Harris, '96
P. A. Hubert, '04
William E. Hussey, '98
F. E. Idell, '77
David C. Johnson, '06
Lowell C. Langlotz, '12
George A. Evans, '06
Raymond P. Loughlin, '12
A. G. Lundgren, '08
H. E. McGowan, '94
Walter C. McEvoy, '12
Charles F. Meyerherm, '11
W. E. Paulson, '04
Duffield Prince, '98
Oscar C. Röesen, '12
Francis M. Sanborn, '91
August Siegele, '01
S. P. Snyder, '06
J. H. Peper, '09
Jerome Strauss, '13
C. A. Stewart, '09

1910 BANQUET AT CASTLE

The Class of 1910 held a class reunion and banquet at Castle Stevens on the evening of Friday, November 22, 1912. About twenty members of the class were in attendance.

COLLEGE NEWS

"BLAZER GIRL" THE VARSITY SHOW

The Stevens Dramatic Society will present an original musical comedy, entitled "The Blazer Girl," at the college auditorium on Thursday evening, February 6. The book was written by Trewin, '13, and Kay, '14, and the music by Russ, '13, Silbert, '13, Cawley, '14, and Milligan, '15. The cast is an exceptionally good one.

The first act is staged in a room in a dormitory, while the second act takes place in a hotel in the Catskills, and the third act shows the hotel exterior.

B. Franklin Hart, Jr., '87, will coach the cast.

CASTLE STEVENS AFFAIRS

S. H. Lott, '03, is now Manager of the Castle, having succeeded Charles H. Phelps, '08.

A new combination pool and billiard table has been placed in the music room on the main floor. The table is reserved for the use of the Faculty at noontime, but is available to the students at all other times.

Mrs. Alexander has presented to the Castle a very fine mahogany boudoir desk.

A sago palm has been presented to the Castle by Miss Mary B. P. Garnett. This palm has an interesting history, which is related by Miss Garnett in a letter to the Manager of the Castle, in part as follows: "It was raised in the old Castle Point greenhouse (under the hill, at the flower garden) and was sent to my mother by Mrs. M. B. Stevens twenty-five or thirty years ago. There used to be two palms like it in the old greenhouse, and they were so very large and old that they were sent to Washington as curiosities when the greenhouse was torn down. This one was, I think, a shoot from those."

ATHLETICS

The 1912 football season was hardly as successful as the Alumni had come to hope for from preliminary reports. The crushing defeat administered by Rutgers in the final game of the year was its climax. The team fought gamely, and compelled the admiration of the large crowd that thronged Castle Point Field on November 23, but the fact remained, after it was all over, that the victors were the better team by a large margin. No adverse wind, no overwhelming prowess of a single opponent could be invoked to explain the 26 points by Rutgers against the 6 of Stevens.

In considering the season as a whole, it is illuminating to refer to an editorial which appeared shortly after the game in *The Stute*, the college weekly, which said in part:

"We are the victims of an idea. Our whole football season is based on the theory that we must win the Rutgers game. The other games don't count. And if we do beat Rutgers, what does it mean? With all due respect, Rutgers is barely on the football map. Certainly they are more so than Stevens, but that does not command much attention. And the fame of Stevens as a college of engineering goes far beyond New Jersey. A winning football team is *not* a team that defeats Rutgers. It is a team that holds Army to a small score and defeats R. P. I., Union, and every other like team that we play."

There is much food for reflection in this comment, particularly in view of the fact that Stevens won a single game on its schedule, that with Johns-Hopkins. The season's record follows:

September 28, at Princeton.........	Princeton	65—Stevens 0
October 5, at West Point...........	Army	27—Stevens 0
October 12, at Haverford...........	Haverford	9—Stevens 0
October 19, at Castle Point.........	Rensselaer	7—Stevens 0
October 26, at Chester, Pa..........	Penn. Military	13—Stevens 6
November 2, at Baltimore...........	Stevens	13—Johns Hopkins 12
November 5, at New York..........	Fordham	13—Stevens 12
November 9, at Castle Point........	Union	14—Stevens 6
November 16, at Castle Point.......	Fordham	14—Stevens 13
November 23, at Castle Point.......	Rutgers	26—Stevens 6

At a meeting of the United States Intercollegiate Lacrosse League on October 19, 1912, Stevens was shifted from the Southern to the Northern Division of the League, and will now meet Cornell, Harvard and Hobart in championship matches, instead of Swarthmore, Johns-Hopkins and Lehigh. The lacrosse management announces, however, that these teams will remain upon the schedule, and will be joined by Carlisle. The 1913 schedule should therefore be the most interesting in many years.

Stevens was defeated in two practice lacrosse matchs on the fall schedule. On October 26, 1912, the Bronx Lacrosse Club, with five Stevens men in its depleted line-up, won, 5 to 3. On November 2, the Red and Gray put up a stiff fight against the Crescents, losing, 3 to 1.

FRESHMEN VANQUISH SOPHS

The freshmen were unusually successful in the interclass contests last fall. For the first time in many years they won the cane rush. At the call of time the upperclass committee found ten freshmen and nine sophomore hands grasping the cane. The Class of 1916 won all three canes in the cane sprees. Jones, '16, defeated Beck, '15. Hoinkis, '16, won from

Crane, '15, and Savale, '16, was too quick for Riggins, '15. The freshmen likewise defeated their traditional enemies in the annual football game. They tallied 13 points, while the sophomores were blanked. The entering class added to its laurels by winning the interclass track meet, 59 points to 40 for 1915.

GIFT OF THERMIT APPARATUS

The Department of Shop Practice has recently received from the Goldschmidt Thermit Company, of New York, a complete set of apparatus used in making thermit welds for both solid work and for pipes.

Besides W. C. Cuntz, '92, Treasurer and General Manager, the Goldschmidt Company has on its operating force the following Stevens men: H. B. Atkins, '92, Controller; F. W. Cohen, '92, Engineer; J. H. Deppeler, '06, Superintendent.

PROFESSOR MARTIN'S NEW BOOK

"Applied Statics," being Volume IV of Professor Martin's "Text-Book of Mechanics," was issued by John Wiley and Sons on December 4.

This volume of the series deals with the applications of the principles of statics to both structures and machines.

Engineering problems involving the applications of the principles of kinetics will be discussed in another volume of this text-book.

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HYDROELECTRIC DEVELOPMENTS AT NIAGARA FALLS*

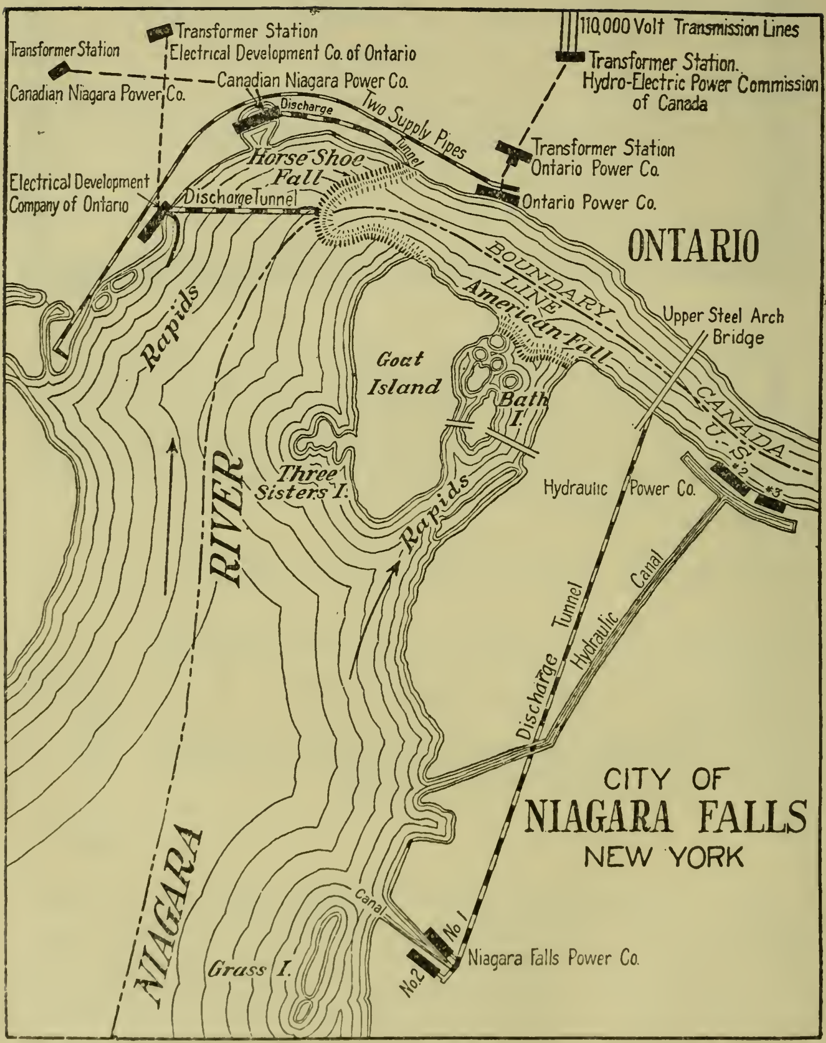
By Professor Albert F. Ganz, M.E., '95

THE Niagara River with its world-famed waterfall connects Lake Erie and Lake Ontario; it is 36 miles in length, 22 miles from Lake Erie to the Falls, and 14 miles from the Falls to Lake Ontario. Its sources are the four great upper lakes.

The descent of the Niagara River, from lake to lake, is approximately 336 feet, distributed as follows:

From Lake Erie to the beginning of the Upper Rapids (22.5 miles),	15	feet.
In the Upper Rapids above the Falls (0.5 mile)	55	"
In the Falls,	161	"
In the Lower Rapids from the Falls to Lewiston (7.6 miles),	98	"
From Lewiston to Lake Ontario (6.4 miles),	7	"
	336	"

It is estimated that about 275,000 cubic feet of water pass over the Falls every second with Lake Erie at a mean level of 573 feet; with a drop of 161 feet in the Falls, this is equivalent to about 4,000,000 mechanical horse-power which is going to waste in the Falls proper; this could be converted into about 3,000,000 horse-power of available power by suitable machinery, assuming 75% for the efficiency of conversion. It will be seen from the above table that there



Map of Niagara Falls, showing location of power stations.

is nearly as much drop in level in the Upper and Lower Rapids as in the Falls proper, so that in these rapids there is an additional waste of about 4,000,000 horse-power.

The present power plants at Niagara Falls take water from some point at or above the Upper Rapids and discharge it into the river below the Falls, thus obtaining an available head of from 135 to 212 feet. These power houses have a present total installation of approximately 580,000 horse-power. The amount of water which may be taken for power purposes is limited by a treaty between the United States and Canadian governments. The contemplated ultimate capacity of the present power houses based on the amount of water granted to the various power companies is about 700,000 horse-power. The water used by these power houses is diverted from the Falls, this amount at present being about 17% of the total water passing over the Falls.

It has been proposed to utilize the head lost in the Lower Rapids between the base of the Falls and Lewiston for producing power without diverting any water from the Falls. One of these proposed plans contemplated the excavation of a surface canal from a point nearly beneath the Grand Trunk Railway bridge, at the head of the Whirlpool Rapids, to an indenture known as the Devil's Hole, on the American bank, about 10,000 feet down stream, and affording an available head of about 73 feet. This plan has, however, been abandoned at present.

The locations of the five principal power developments at present in operation at Niagara Falls are shown on the accompanying map. An approximate summarized statement of the present and contemplated capacity of these power stations is given in the following table:

TOTAL CAPACITY OF THE FIVE LARGE ELECTRIC POWER DEVELOPMENTS AT NIAGARA FALLS

	Total Horse-Power	
	At present installed	Contemplated ultimate capacity
American Side:		
Niagara Falls Power Co.:		
Power House No. 1,	55,000	55,000
Power House No. 2,	60,500	60,500
Hydraulic Power Co.:		
Power House No. 1 (abandoned),	—	—
Power House No. 2,	35,000	35,000
Power House No. 3,	120,000	130,000
Canadian Side:		
Canadian Niagara Power Co.,	75,000	125,000
Ontario Power Co. of Niagara Falls,	140,000	166,000
Electrical Development Company of Ontario, Ltd.,	93,000	125,000
Total,	578,500	696,500

The special features of each of the above power plants will be briefly described in the following:

Niagara Falls Power Company

The Niagara Falls Power Company was the first of the very large electric power developments at Niagara Falls. The charter for this development was obtained in 1886. An international committee of engineers was selected to decide upon the methods to be adopted for developing and transmitting the power to be derived from the waters of the Falls. This committee decided upon the plan briefly outlined in the following, and work upon the first power house, known as Power House No. 1, was begun in 1890; this power house was completed in 1900. A second power

house, known as Power House No. 2, was completed in 1904. The general plan of construction for these power houses is as follows: A short surface canal is excavated at a point about one mile above the Falls on the American side of the river in a direction approximately at right angles to the river. (See map.) On each side of this canal a wheelpit is excavated, each one about 450 feet in length, 18 feet in width and 180 feet in depth. Water turbines are located at the bottom of these wheelpits, and the water for these turbines is supplied from the canal by means of steel penstocks, one penstock supplying each turbine-unit. After passing through the turbines the water is discharged into a tunnel about 21 feet in diameter, which carries it off under the City of Niagara Falls to the Lower Niagara River, a distance of approximately 7,000 feet. This tunnel has an average grade of 6 feet in 1,000 feet, making a total loss of head in this discharge tunnel of about 42 feet. Each turbine is connected through a hollow vertical shaft to an alternating current generator installed above the ground level.

Power House No. 1 is situated on the down-stream side of the intake canal. In this power house were originally installed ten Fourneyron inverted outward-flow twin-turbines without draft tubes, each of 5,000 horse-power capacity at a speed of 250 revolutions per minute, and located about 140 feet below the power house floor. The available head of water is 136 feet. Each turbine is coupled to a 5,000 horse-power, 2-phase, 25-cycle, 2,200-volt, alternating-current generator through a hollow steel shaft 38 inches in diameter. Operation of this power house was begun in 1895, with three generating units installed, and the entire original installation of ten units was completed in 1900.

Power House No. 2 is located on the up-stream side of the canal. This contains eleven Francis single inward-flow turbines, each of 5,500 horse-power capacity at a speed

of 250 revolutions per minute, and located about 134 feet below the power house floor. These turbines are equipped with draft tubes increasing the effective head of water supplied to the turbines to about 141 feet. The turbines are governed by means of hydraulic governors operated by means of oil under pressure. These turbines are also connected to alternating-current generators placed above the ground level by means of hollow steel shafts. Six of these generators are similar to those installed in Power House No. 1 and have externally revolving fields. The remaining five, which were the last installed, have outside stationary armatures and inwardly revolving field structures.

During the period from 1910 to 1912, the ten outward flow turbines without draft tubes in Power House No. 1 were replaced by 5,500 horse-power Francis inward flow turbines with draft tubes, similar to those installed in Power House No. 2, giving 10% increased capacity for the same quantity of water.

The two power houses have an aggregate capacity of 115,500 horse-power, and at present utilize all of the water granted to the company by the treaty between the United States and Canada. Normally the units in both stations operate in parallel. Part of this power is distributed locally at 2,200 volts and at 11,000 volts for use in electrochemical works. The remainder is raised to 22,000 volts and is transmitted to Buffalo and to intermediate points. There are two separate pole lines going by different routes carrying 3-phase transmission lines to Buffalo. Two of these lines consist of copper cables, and the third line consists of aluminum cables. These transmission lines end on the outskirts of Buffalo in transformer stations where the voltage is reduced to 11,000 volts for transmission to sub-stations in Buffalo by means of underground cables. The approximate distance from the power house in Niagara Falls to the transformer stations in Buffalo is 22 miles.

DEVELOPMENTS AT NIAGARA FALLS

Canadian Niagara Power Company

The Canadian Niagara Power Company is an allied company of the American Niagara Falls Power Company. In general the hydraulic developments of the Canadian Niagara Power Company are similar to those of the American plants of the Niagara Falls Power Company. There is one power house and this is situated in Queen Victoria Niagara Falls Park, about one-half mile above the Horseshoe Falls. The water is taken in from the river through a short intake canal and forebay, delivered through steel penstocks into turbines at the bottom of a wheelpit, and carried away to the Lower Niagara River through a tunnel about 2,000 feet in length.

When this power house was planned in 1899, the company expected to install 20 units of 5,000 horse-power each, aggregating 100,000 horse-power. Up to that time units of a capacity larger than 5,000 horse-power had not been constructed. In 1901, when the actual design of the turbine and generator equipment was undertaken, larger units had been developed, and units of 10,000 horse-power were accordingly adopted.

Six turbine units are at present installed in this power house having an aggregate capacity of 62,500 horse-power. The first five installed have a capacity of 10,000 horse-power each; the last one installed has a capacity of 12,500 horse-power. The turbines are of the Francis twin-balanced inward flow type, and operate at a speed of 250 revolutions per minute. The turbines are supplied from penstocks 10 feet in diameter and discharge into two cast-iron draft tubes 5 feet in diameter. Each turbine is connected to an alternating-current generator developing 11,000-volt, 25-cycle, 3-phase current. These generators have internally revolving fields. This power house also contains three turbine-driven exciter units consisting of 200 kilowatt 125-volt,

direct-current generators, driven at 600 revolutions per minute by means of vertical shafts from Francis inward-flow turbines. A seventh unit of 12,500 horse-power capacity similar to unit No. 6 is in course of erection and will be ready for service early in 1913, bringing the total installed capacity of this station up to 75,000 horse-power. The intake canal and discharge tunnel provide for a total capacity of 125,000 horse-power.

A part of the alternating current generated in this power house is transmitted by means of cables in underground conduits to a transformer station located on the bluff above the power station where it is raised to 22,000 volts and transmitted to Buffalo. Part is transmitted at 11,000 volts to the power station of the American Niagara Falls Power Company, from where it is distributed in parallel with the power generated in the American power station. This means that some of the generators in the Canadian power house operate in parallel with the generators in the American power houses.

One of the great difficulties which was encountered in the operation of the first power house on the American side of the Falls was the accumulation of ice in the intake canal. Special arrangements were therefore made to overcome this difficulty in the construction of the later Canadian plant by providing a separate ice sluiceway leading from one side of the forebay into the Niagara River at a point about 500 feet below the intake canal.

Hydraulic Power Company

The company of which the Hydraulic Power Company is the outcome was incorporated in 1853. Work on a power development was begun in 1861, when a surface canal, 36 feet wide and about 8 feet deep, was built extending from the Upper Niagara River to a point on the Lower Niagara River just below the present upper steel arch bridge, the

difference in level between the water in the canal and in the lower river being about 220 feet. (See map.) Between 1870 and 1880 a number of small mills utilizing the water from this canal were built along the edge of the Lower Niagara River below the canal. The water wheels as constructed at that time could not, however, utilize the entire available head, but only a head of from 25 to 75 feet, and the remaining head was allowed to go to waste.

In 1877 the Niagara Falls Hydraulic Power & Manufacturing Co. was organized, and this company acquired all of this canal property. In 1910 the name of this company was changed to the Hydraulic Power Company. In 1881 this company established its first electric power station to supply electricity for commercial purposes. This station was known as Power House No. 1, and was located in the building which is now occupied by the Cliff Paper Mill. In this station were installed arc light dynamos driven by belts from the mill shaft; these were used to furnish street and store lighting. From this station electricity was in fact first publicly distributed at Niagara Falls. This station is now abandoned.

In 1896 a new power house was built just below Power House No. 1 known as Power House No. 2. In this power house the 210-foot head available is utilized, and there are installed a number of horizontal turbines driving electric generators of a variety of types. The station contains in all sixteen turbine-units and the total output is about 34,000 horse-power. A number of the electric generators are direct-current machines generating 125 to 300 volts, and of large current capacity, the direct current being conveyed by heavy aluminum bars and cables to electro-chemical works situated on the bluff immediately above the power house. There are also a number of 600-volt direct-current railway generators, and two 11,000-volt, 3-phase alternating-current generators for transmitting power to distant points.

The construction of Power House No. 3 was begun in 1905. It is situated on the river level several hundred feet below Power House No. 2. The turbines and generators are of the horizontal type. The turbines are placed in a room separated from the generator room by a concrete wall, and water is delivered from the canal to the turbines through one penstock for each turbine. These penstocks enter the casing of the turbine from the top. The turbines are of the mixed flow type, the water entering from around the entire circumference and flowing inwardly and then discharging horizontally to the right and to the left through draft tubes which are so arranged as to balance the horizontal thrust. The two draft tubes from each side of a turbine are connected to each other by pipes about one foot in diameter for the purpose of equalizing the horizontal pressure. Five direct-current and seven alternating-current units are installed at present. Each direct-current unit consists of one 10,000 horse-power turbine coupled to two direct-current generators provided with double commutators. Each generator is rated at 3,500 kilowatts at 650 volts, and delivers 5,430 amperes. The direct-current is used in the new works of the Aluminum Company of America located in a large concrete building with conspicuous concrete ventilators on the bluff above the power house. Each alternating current unit consists of one 10,000 horse-power turbine coupled to a three-phase, 12,000-volt, 25-cycle alternator. Two 1,000-horse-power turbine-driven exciter units are also installed. The hydraulic arrangements provide for one more turbine-unit, which will give an ultimate capacity of 130,000 horse-power.

Ontario Power Company of Niagara Falls

The power house of the Ontario Power Company is located on the level of the Lower Niagara River on the Canadian side of the river just below the Horseshoe Falls. (See map.)

Owing to its location it was necessary to make this power house as narrow as possible. Its width is 76 feet, and when completed its length will be about 1,000 feet. The transformer and distributing station is located on the bluff above the power house.

Water for this power house is taken in at Dufferin Island just above the Upper Rapids so as to obtain the advantage of the head lost in the Upper Rapids. This water is conveyed to the power station by means of two conduits about one mile in length laid just beneath the surface of the street level, each conduit being 18 feet in diameter. One conduit is a steel tube embedded in concrete, and the second conduit is a reinforced concrete structure. One more conduit will be required when the ultimate capacity of the station is reached. From these conduits water is delivered to the power house below through steel penstocks nine feet in diameter, each penstock supplying one pair of turbines.

The turbines and generators are of the horizontal type. Each unit consists of two Francis mixed-flow turbines discharging from the inside at the center so as to balance the horizontal thrust. These turbines operate at 187.5 revolutions per minute under an effective head of 175 feet, of which 20 feet is obtained from the draft tubes; the turbines were thus placed high above the level of the river in order to provide for the excessive variations of the level of the water in the river at this point. Each pair of turbines is coupled to a horizontal shaft to which is also coupled one 25-cycle, 12,000-volt, 3-phase, alternating-current generator. The first three units installed have a capacity of 10,000 horse-power each, the next seven units installed have a capacity of 12,000 horse-power each, and the last two units installed have a capacity of 13,000 horse-power. The twelve units installed at present have an aggregate capacity of 140,000 horse-power. Work is in progress for the installation of two additional units of 13,000 horse-power

each, which will bring the total capacity of this station up to 166,000 horse-power.

The electrical power at 12,000 volts is delivered to a transformer and distributing station situated on the bluff above the power house by means of cables in underground conduits. For local distribution the 12,000-volt power is distributed directly. For distant transmission the voltage is raised in this transformer station to 60,000 volts and is transmitted to and beyond Syracuse, a distance of over 160 miles.

Electric power at 12,000 volts is also delivered from this station through underground conduits to a transformer and distributing station of the Hydro-Electric Commission of Ontario, located about one-half mile fron the transformer station of the Ontario Power Company. At the station of the Hydro-Electric Commission the voltage is raised to 110,000 volts, and this is transmitted in various directions through Canada, and as far as St. Thomas and Toronto. This transformer station contains groups of 3,000 kilowatt water-cooled oil-transformers. Each group of three transformers has its primaries connected in delta to the 12,000-volt supply, and the secondaries connected in Y to the line wires, delivering 110,000 volts to the line wires. The neutral point of the secondary of each transformer group is connected to a neutral bus-bar, and this is grounded through a water resistance. The power is supplied from the supply cables to the transformer primaries through oil switches and auxiliary bus-bars, so arranged with selector switches, that any tranformer group can be supplied from any supply cable, or all may be operated in parallel. The 110,000-volt power is delivered from the transformer secondaries through single-pole oil switches to bus-bars, and from these this power is supplied through single-pole oil switches to the transmission lines. The 12,000-volt distribution and switching apparatus is located

in a basement, and the transformers in one room on the ground floor extend the length of the building, and the 11,000-volt distribution and switching apparatus is located in an adjoining room. The controlling switchboard is in a gallery overlooking the room containing the switches. The entire arrangement gives the impression of great simplicity. Two transmission lines are installed at present, each consisting of three No. 0000 aluminum stranded cables, supported from one set of steel towers by suspended type insulators, with double strain insulators at suitable intervals and at all road crossings. There are ten towers per mile on an average. From Niagara the two lines extend to Dundas; from here two lines go to Toronto, and one line makes a loop passing through Guelph, Preston, Berlin, Stratford, St. Marys, London and Woodstock, with a branch line from London to St. Thomas. The total length of transmission lines installed at present is about 300 miles.

Electrical Development Company of Ontario, Limited

This power development was planned in 1902 by Toronto interests for the purpose of carrying Niagara power to the city of Toronto by electrical transmission. The name of the original company was the Toronto and Niagara Power Company. This development was later taken over by the Electrical Development Company of Ontario, Ltd., and in 1908 it was leased by the Toronto Power Company which operates this development at present.

The power station is located on the Upper Niagara River on the Canadian side at a point corresponding to about the middle of the Upper Rapids. (See map.) The general plan of this power house is the same as that of the Canadian and American Niagara Falls Power Company's plants, that is, it consists of a deep wheelpit with turbines located at the bottom and with generators located above the surface of the ground.

The water from the turbines discharges into two tunnels,

one on each side of the wheelpit, which two tunnels unite into one large tunnel, and this is carried under the Niagara River to about the center of Horseshoe Falls, and there discharges into the Lower Niagara River under the Horseshoe Falls. This location of the discharge tunnel has made it possible to use a comparatively short tunnel. (See map.)

Seven turbine units have been installed, four of a capacity of 12,000 horse-power each, and three of a capacity of 15,000 horse-power each, making a total present installed capacity of 93,000 horse-power.

The turbines operate under an effective head of 143 feet. Each turbine is connected to an alternating-current generator by means of a hollow vertical shaft 115 feet long supported by three intermediate step bearings. Each generator delivers 3-phase, 25-cycle, 12,000-volt current. The machinery of this power house is controlled from a switchboard gallery located in the generator room. There are two motor-driven exciter units on the generator floor, and also two turbine-driven exciter units on the turbine floor.

The wheelpit and other hydraulic arrangements are complete for four additional penstocks and turbine units. When sufficient additional units have been installed so that all of the water granted by the present treaty between the United States and Canada is utilized, this station will have a total capacity of 125,000 horse-power.

The transformer and distributing station for this power house is located on the bluff above the power house. The current is raised to 60,000 volts potential and is transmitted to Toronto, which is 85 miles distant, over a transmission line located on a private right-of-way. A new 85,000-volt transmission line is now in course of construction on the same right-of-way to Toronto to take care of the increased demand for power in Toronto.

GREAT SUCCESS ATTENDS ALUMNI DINNER IN HONOR OF PRESIDENT HUMPHREYS.

The largest and most successful of Stevens Alumni Banquets was held in the grand ballroom of the Hotel Astor on Friday evening, February 14, 1913. The dinner was a testimonial to Dr. Alexander C. Humphreys in honor of his completion of ten years' service as President of Stevens. Nearly seven hundred alumni and guests were present. The boxes about the room were given over to the ladies, and their participation in a Stevens Alumni Banquet formed one of the innovations of the occasion.

Printed seating lists, including the names of all present, were again used to direct the diners to their respective tables, and there was a minimum of confusion in the seating arrangements.

Grace was said by the Rev. Dr. William R. Jenvey, rector of St. Paul's Church, Hoboken, after which the "Alma Mater" was sung and the diners sat down to enjoy an excellent menu. Throughout the serving of the dinner there was music by an orchestra and the great organ which the ballroom boasts.

The souvenir of the occasion was a neat booklet of pocket size, bound in red leather and bearing the seal of the college. The text was printed in red on gray paper, and each booklet was provided with an excellent likeness of Dr. Humphreys as an insert, and was autographed by him. A Stevens postal card ready for mailing and a reproduction of the architects' design for "Greater Stevens" were also enclosed in the case with the combined menu, song book and guest list.

A feature of the dinner was the fact that with one or two unavoidable exceptions, every member of the Senior Class was present to do honor to President Humphreys on behalf of the student body. The list of invited guests present was remarkable, too, including men eminent in many walks of life who were eager to seize the opportunity to exhibit their appreciation of Dr. Humphreys' work at Stevens.

The speakers included Palmer C. Ricketts, C.E., E.D., President of Rensselaer Polytechnic Institute; Walton Clark, M.E., Sc.D., Vice President of the United Gas Improvement Company; Henry S. Pritchett, Ph.D., Sc.D., LL.D., President of the Carnegie Foundation for the Advancement of Teaching; George Harvey, LL.D., Editor of *Harper's Weekly* and the *North American Review;* Charles F. Kroeh, Professor of Modern Languages and Secretary of the Faculty at Stevens; John H. Finley, LL.D., President of the College of the City of New York; Henry Torrance, M.E., Stevens, '90, Vice President of the Carbondale Machine Company; George T. Wilson, A.M., Vice President of the Equitable Life Assurance Society; Albert F. Ganz, M.E., Stevens, '95, Professor of Electrical Engineering at Stevens; James E. Pinkney, M.E., Stevens, '06, assistant to Chief Engineer, Robert Hoe & Co., and J. H. Vander Veer, President of the Senior Class at Stevens.

The committee in charge, whose unremitting efforts were largely responsible for the complete success of the affair, comprised John S. DeHart, Jr., '90, *chairman;* William A. Adriance, '85; William E. S. Strong, '92; Harold E. Griswold, '93; Percy C. Idell, '99, and David C. Johnson, '06. Louis A. Martin, Jr., '00, treasurer of the Alumni Association, and his assistant, G. G. Freygang, '09, coöperated in handling the finances, while a special sub-committee of the Alumni Publicity Committee, consisting of F. DeR. Furman, '93, *chairman;* Robert W. Pryor, '02, and G. E. Terwilliger, '09, prepared advanced material for the press and

supplied information on the night of the dinner to the reporters present.

The Toastmaster, E. H. Peabody, '90, finally obtained order at 9.30 p. m. W. M. Kelly, '13, led the throng of diners in the locomotive yell, with three "Prexies" on the end, after which "The Mechanical Engineer" was sung.

THE TOASTMASTER: [trying to restore order after the song.] There is something—(Voices: Louder!)—there is something in that song—(Voices: Louder!)—there is something in that song about closing up at midnight. We must remember that in this program. (Voices: Louder!—Laughter.)

I want to announce that there are seven hundred Stevens men and their friends in this room to-night. (Great applause.) A great many of the branch alumni associations have sent delegates. Many of the classes are here in much stronger force than ever before. We haven't time to analyze it now, but it will make some interesting reading in the INDICATOR.

I have some announcements to make. Here is a long document, which presumably came over the telegraph wires, because it is on a telegram blank.

"1905 Publicity Bureau.—We think the engineers should have their salaries raised. (Great applause.) The Dinner Committee has helped to increase the cost of high living. The gang is getting nervous. Say something about that new electrical Lab. Will you allow that member of 1913 to respond to the toast on the Faculty? We suggest that the victims of the weeding-out process attend the agricultural course at Cornell. (Laughter.) After looking the ground over, we would like to reserve some of the boxes for the banquet which was referred to at the alumni meeting. We wish to correct Dr. Humphreys' statement at the midwinter meeting. It was 1905, not 1907, who had aëroplanes."

Among the great number of letters received we have chosen

at random just a few to read to-night, letters of regret from gentlemen who could not be present. It is unfortunate that we cannot read them all, but we haven't the time. Here is a letter from the Class of '73. It says:

"While the Class of 1873 will, through ill health, be unable to attend the present annual banquet, yet it is with you in spirit and gives greeting, with every feeling of appreciation and good will. Very sincerely yours, J. A. Henderson, Class of '73." (Applause.)

Mr. Henderson bears the distinction of being the first graduate of Stevens. Here is a telegram from Col. Robert M. Thompson:

"I sincerely regret that I cannot be with you to-night to express the respect and affection I have for Dr. Humphreys in the highest sense of the word. We cannot do him honor, but we can show our appreciation of the honor he has conferred upon us and the service he has rendered his school and his country."

A telegram from J. E. Sague, of the Public Service Commission, New York, and one of our alumni:

"I regret that I cannot get to the dinner this evening. Earnest congratulations upon your splendid administration of the Institute."

That is addressed to the Doctor. Here is a cablegram from Paris from G. A. Trube, '90, now manager of the French Westinghouse Company.

Mr. Torrance: '90 there! Hurrah for '90! (Laughter and applause.)

The Toastmaster (reading): "Congratulations President Humphreys. All success to Stevens."

A telegram from Nelson Ogden, '10, one of our graduates:

"Whoop her up for Stevens and Prexy. Wish I were with you to help you do it."

Just a brief word about these letters. One from Judge Gary in which he says:

"I regret exceedingly I cannot . . . be present. I have an engagement for that evening. Every one present will honor themselves in their effort to honor Doctor Humphreys. Sincerely yours, E. H. Gary." (Applause.)

A letter from A. Barton Hepburn:

"I know Dr. Humphreys very well . . . and regret exceedingly my inability to join you upon this occasion. I shall be present in spirit and echo every good sentiment and every good word said of Dr. Humphreys."

A letter from F. S. Witherbee, which ends:

"Your Institute is most fortunate in having for its head a man of not only great technical ability, but of equal sagacity in business affairs—a rare combination in any one man." (Applause.)

Here is a letter from Woodrow Wilson. (Great applause.)

"I wish sincerely that I might accept the invitation of the Stevens Institute graduates contained in your kind letter of January fifteenth, but I have made a solemn vow that I will decline all invitations, even those of capital importance, between now and the time when I shall feel myself settled in harness at Washington.

"I am sure that the Committee will understand and I hope they will approve this decision on my part.

"Cordially and sincerely yours,

"Woodrow Wilson." (Great applause.)

Isaac N. Seligman writes a letter in which he says:

"Apart from his great scientific attainments and executive ability, Doctor Humphreys is a notable example of what can be accomplished by one who, although immersed in business affairs, still finds time to devote to public affairs and to manifest a civic spirit in whatever he undertakes. In reviewing his life one cannot but feel that, whatever office he has graced, he has done well, done wisely, and done much. It affords me great pleasure to record my high appreciation of Doctor Humphreys."

Because we are graduates of Stevens Institute of Technology; because we prepared for our professional life at that college of engineering founded by our friend and benefactor, though we did not know him personally, the late E. A. Stevens; because we spent four years getting polished at the Old Stone Mill and we found that that polish lasted; and because we are enthusiastic and loyal in the cause of our alma mater and the work that she is doing and will do, and because these, our distinguished guests whom we welcome to-night, are interested in Stevens men and in what Stevens is doing—we are assembled here to-night to honor, in this the beginning of his eleventh year as president of Stevens Institute of Technology, our friend and fellow alumnus—Alexander Crombie Humphreys. (The diners all rise and cheer enthusiastically. Dr. Humphreys rises and bows his acknowledgment. Cheers are repeated, ending in "Prexy! Prexy! Prexy!")

We like better to call him Prexy. You will hear more of Prexy during the evening and you will hear more of Prexy during the next ten years. (Applause.) This is an unusual occasion. We are doing unusual things and Prexy is an unusual man. We like to say it. It is unusual to count the term of the office of President of Stevens Institute of Technology by decades, but we are beginning to do that. It is unusual to have so able a Dinner Committee and it is unusual to give that committee a vote of thanks, but Johnny De Hart deserves, and I am going to ask you—it is in fact moved and seconded—J. A. Dixon moves and the Class of '07 seconds—a vote of thanks, to Johnny De Hart and his able committee. All those in favor say aye; opposed, no; carried! Stand up, Johnny; where are you?

Mr. Torrance: Hooray for '90. (Laughter.)

The Toastmaster: It is unusual to have our dinner in this large and elegant room with its unusual acoustic properties. (Voices: Louder!) If you will all keep quiet, you

will appreciate these acoustic properties. It is unusual to have such a galaxy of distinguished speakers as we have this evening, all pledged to confine their remarks to a limit of five minutes. (Voices: Hear! Hear!—Laughter.)

VOICES: The chairman, too.

THE TOASTMASTER: It is unusual to have our feast on St. Valentine's Day, and it is unusual to have the ladies with us.

Ladies, we greet you here to-night
  We feel the charm your presence brings;
We view with joy the unusual sight
  Of such unusual, lovely things.
We are but men—yet were we kings
  We'd ask no other queens or shrines,
While round the boxes' circle swings
  Our toast to you,—our Valentines.

We ask no other joy so bright
  As that which from your smiling springs;
Ambition soars to any height
  When men attempt unusual things.
Speak not of vain imaginings,
  Nor break the faith that intertwines
With hope to which each fondly clings—
  We pray you be our Valentines.

And so, when onward in the flight
  Of future years, the inevitable wings
Of Time shall lift us—happy quite,
  We'll face the task of unusual things—
And while the player's vibrant strings
  Set merry measure to our lines,
This be the song the chorus sings—
  "Stevens girls for our Valentines."

Mrs. Humphreys—our offerings
  Are to him who does unusual things,
Of you we ask, if your heart inclines—
  Bring us again our Valentines.

(The whole audience rose and drank the health of the ladies in the boxes. This was followed by a Stevens cheer, ending with "Mrs. Prexy, Mrs. Prexy, Mrs. Prexy.")

I spoke about the wonderful acoustic properties of this hall. If you can acquire the knack of throwing your voice in the right direction, you get a most unusual echo. I will give you an illustration.

What is the next important event?

ECHO: Important event.

THE TOASTMASTER: The answer is Alumni Day.

ECHO: Answer is Alumni Day.

THE TOASTMASTER: Give the date of Alumni Day?

ECHO: June seventh.

TOASTMASTER: Say it again so all can hear and make a note of it.

ECHO: Alumni Day, June 7th. (Great laughter.)

THE TOASTMASTER: Have you seen the last number of *Harper's Weekly?*

ECHO: I devoutly hope so. (Laughter.)

TOASTMASTER: Say that again so that Colonel Harvey can hear it.

ECHO: I devoutly hope so. (Laughter.)*

THE TOASTMASTER: The first speaker on our list to-night is a gentleman known to you all by reputation. I asked him what points he desired me to bring out when introducing him and he said, "Why, just tell them who I am," and I believe that is all I need to do. But the relationship between the Rensselaer Polytechnic Institute and Stevens Institute of Technology is so unusual that I want to say one word about it. The Institute at Troy was the first college of engineering in this country. It started with civil engineering and for many years continued that course alone. Stevens was the

*The toastmaster addressed these remarks to various corners of the room, the "echo" always answering from the corner addressed, with the exception of the last echo which came from a point directly over Col. Harvey's head.

first college of mechanical engineering, and we still continue to teach that course only. Under the able leadership of its president, Troy has developed greatly and taken up other lines, and we need to be no great prophets to know that Stevens is going to develop also—though perhaps not along other lines as to courses. Dr. Ricketts is prominent not only as an educator, but as a civil engineer, and I will now call upon him to address you with a few brief remarks.

Address of Palmer C. Ricketts: *Mr. Chairman, Graduates of Stevens, Ladies and Gentlemen*—There are more reasons than one why I should be glad to take part in any celebration of Stevens, and particularly in any celebration which has to do with Dr. Humphreys' incumbency of the office of president. Ever since I have had an intelligent appreciation of the work of the engineering schools of this country, I have understood the fact that the Stevens Institute of Technology has stood in the very front rank of such institutions, and I have known why it stood there. Not because of any large endowment, not because it has had the greatest number of students, but because from the beginning it has stood for earnest, thorough work of a high character. It has exacted such work from its students. It has been necessary for them to reach a high standard of scholarship before they could attain the honor of graduation, and the value of its methods has been shown by the great work of its alumni in your profession, a work not limited by the boundaries of any country, but which has had the world for its field.

We do not have to go far to prove these opinions. Many men before me this evening afford such proof, and not the least among them is the man who as President of Stevens we are here to honor to-night. Standing in the front rank of his profession, the past president of one of the great professional societies, the president of one of the greatest of our schools of engineering, Dr. Humphreys is indeed a

worthy example to show what graduates of Stevens have done for engineering. (Great applause.)

He might be all this, however, and yet not hold the place he does in our affections and esteem, for above all else stands character, and it is on account of his character as a man that we are here to-night to congratulate Stevens because he is its President. (Applause.) More than one of the men before me to-night has had occasion to know that when Dr. Humphreys thinks a thing is right, he will stand for it to the last without regard to his own convenience or his own interests. (Applause.)

He has already done a great work for Stevens and he has a great plan for its future development. I do not know that he will see his plan carried out in all its details, but I know this: I know that history teaches, from examples of the past, that whenever a country, a school or a man presses forward courageously, with high ideals, towards a goal the attainment of which is to make for a real benefit to mankind, a real advance for the race, failure has never resulted. And it will not result in this case. Let all friends of Stevens help hold up his hands, so that this plan for its future growth may be pushed forward to a successful completion. (Great applause.)

The Toastmaster: Dr. Ricketts is an honorary alumnus of Stevens Institute of Technology and we are proud of him. "Cap" Hart will now sing "Over on the Jersey Side."

B. Franklin Hart, Jr., '87, then came forward to the platform in front of the speakers' table and sang the song, amid much applause.

The Toastmaster: When Dr. Humphreys took up his work as President of Stevens, he was succeeded as chief engineer of the United Gas Improvement Company by a man who now sits on my left. This gentleman is another honorary alumnus of Stevens and last year the University of Pennsylvania made him a Doctor of Science. We have many

doctors among the speakers this evening. Another thing which brings Mr. Walton Clark close to us is the fact that he is President of the Franklin Institute of Philadelphia, which we all think of in connection with the late Henry Morton and his work there. I have great pleasure in introducing Mr. Walton Clark, who will say a few words to you. (Great applause.)

Address of Walton Clark: *Mr. Toastmaster, Fellow Alumni and Ladies*—Although I know that a certain measure of odium always attaches to an apology, I am constrained to apologize to-night. My voice, never good, is to-night particularly bad. I know nothing of the acoustics of this room, but let me say at the start that I want no Hoboken "bluffs" throwing my words back at me. I have been apprised of the five-minute rule. I have been told that I must tell what I know of Dr. Humphreys in five minutes. I have known him a long while and the man would talk fast who would tell what I know of Dr. Humphreys in five minutes. I couldn't do it in a week, and perhaps I wouldn't in his presence. (Laughter.)

Since it seems almost impossible, and at any rate ill-advised, for me to attempt to discuss Dr. Humphreys, I am going to ask your indulgence while I go back in my own line of business to the prehistoric—I mean the pre-Hoboken—days and tell you a little of how we did it then. That was before Hoboken got into an evil profession, that of letting loose mechanical engineers on the theretofore fair face of nature. It was before Dr. Humphreys beguiled me out of the hospitable South with promise of much cash presently in hand and certainty of early preferment. I was a boy in the New Orleans Gas Works. We might not know much about engineering—probably we didn't; there wasn't a diploma within a mile of the works. Our consumers seemed fairly satisfied and our stockholders got twelve per cent. (Laughter.)

We had also our aspirations and our endeavors after accuracy. We made conscientious efforts to do our work well, to do what we were told to do well. As an instance I remember we were making some changes in the fittings of the condenser room, and that was a dirty job. The foreman of the fitters being at the pipe lathe, said to a man, his assistant, "Mike, go down to the condenser room and bring me a measure of the distance from that elbow I just put in to the inch-and-a-half hole in the condenser." Two minutes later, crossing the yard, I saw Mike conscientiously coming along this way (speaker holding his hands apart), and seeing me, he said: "Don't run agin' me; I got the measure." (Laughter.) I had not intended that as a joke, but rather as an evidence of the conscientious effort of an uneducated man to do his duty.

We do things somewhat differently now. Recently I had occasion to know the capacity of a certain hole in the electric light yard. It was a large hole. I said to Hoboken '12,—and that is not an automobile (laughter), it is a very highly educated young man—I said, "Hoboken, go down and measure that hole for me and tell me how much ashes it will take to fill it."

He sorted out the tripod of his altitudinous theodolite from his lacrosse sticks in the corner of the room; he took his slide rule, known to the profession as a guessing-stick (tumultuous laughter); he took my steel tapeline, on which he had carefully theretofore determined the error due to changes in temperature, he took an assistant and went.

The report that he brought back was so remarkable that I took a memorandum or two from it before I came over to-day, to tell you of it. He told me the capacity of the hole in cubic yards, cubic feet and cubic inches to the second decimal place. He told me the weight of ashes that it would take to fill it. He told me how long it would take us to

accumulate those ashes in our plant, using the coal we were then using, with our then efficiency and with the load factor that the new business department told us to expect. He discussed the wisdom of tamping it as compared with setting it with water. He called my attention to the fact that, inasmuch as we might sometime want subsoil structures on that spot, it would be wise to fill the upper six feet with clay. He told me where I could get the clay and how much it would cost. He had a comparision of the cost of filling that hole with the ashes by wheelbarrow and by cart process. He drew my attention to the importance of studying the influence of the hypothesis of the fourth dimension as useful in the solving of such problems. Finally he said—(at this point the lights in the room very gradually grew dim, causing great laughter.)

Bad as my voice is, I can talk in the dark. (The lights come out again.) Why, don't they get some gas lights in here? (Great laughter.)

In conclusion he respectfully called my attention to the fact that we could not probably get out bonds for this and that the whole cost must be charged to operating. It was really a beautiful report.

I sent for him and said: "1912, why did it occur to you to go to all this trouble to get me up a report covering every possible point and thought in connection with the matter, when all I said was that I wanted to know the contents of the hole?"

He stiffened a little, squared his shoulders—he would have clicked his heels, I think he would have liked to have clicked them—he thought it wasn't respectful perhaps; and he said: "Sir, Dr. Humphreys told us that when we do a thing, we are to do it accurately; that we are to prepare ourselves for anything that may happen in connection with the job we are then performing and to give our superiors any information that they may possibly ask, and, sir," he said, "no graduate

of Stevens has ever had reason to doubt the wisdom of taking Dr. Humphreys' advice." (Great applause.)

THE TOASTMASTER: You know that thing (referring to the lights going down) is automatic. I feel like apologizing to Mr. Clark for it, but we can't help it. (Laughter.) The Banquet committee has carefully studied this question of scientific management, which originated with a Stevens man and has been pushed on by a few others, and the time for each speech to-night has been calculated to a nicety. This electric light is working accordingly. (Laughter.) I have to hurry myself. (Applause.)

We are fortunate in having on the Board of Trustees of Stevens Institute of Technology one of the highest, if not the highest authority on education in this country, and particularly on technical education. Dr. Pritchett, now president of the Carnegie Foundation for the Advancement of Teaching, and formerly president of the Massachusetts Institute of Technology, is, we are glad to say, one of our trustees and also one of our honorary degree men, and also another doctor. We are going to call on him for a few words this evening, and I will sit down at once so that he can begin and maybe gain a little bit on the electric light. (Applause.)

ADDRESS OF HENRY S. PRITCHETT: *Mr. Chairman and Fellow Alumni*—I have wondered whether a man, omitting the customary joke, could, in five minutes, afford to talk seriously about the problems of our institution. I am going to try.

If a man looks out of that window toward one street and another man out of this window toward another street, each man, however honest, will describe a different thing.

Let us look at Stevens Institute for a moment out of the education window for these last ten years, and for another moment out of the trustee window.

I remember the beginning of this ten years well. I

was present when President Humphreys was inaugurated. Among other things I remember that on that occasion I met, almost for the first time, Mr. Andrew Carnegie, with whom I have had more or less business to do since. Looking at Stevens during these ten years from the educational side one sees a most splendid progress. Courses have been improved. New and strong men have been brought in; laboratories multiplied; a splendid site, fit for the noblest technical school in the world, in the midst of the greatest city in the world, has been secured. All along the direction of those things which make for better student life, for better studying, for better facilities, the progress has been magnificent, and this is the work of Alexander Humphreys. (Applause.)

No college president whom I know—and I know a great many—has done a more sincere, a more effective, a more fruitful work in ten years than he. (Applause.)

Let us look for two minutes out of the trustee window. During this great progress, while the numbers have nearly doubled, the facilities increased, the student body become stronger, better trained, better housed, better cultured, while the alumni with admirable devotion have added their help to the endowment and to the resources, the load has steadily grown out of all respect or relation to those funds which have been contributed, and this too in face of the fact that this splendid site in which our institution sits faces the greatest depository of money in the world; and not only that—a depository which every college president from the South or the North or the West seems able to tap.

If these gentlemen who went down to the Pujo Committee from Wall Street the other day had had the courage of their convictions, they would have confessed that the real reason why they have to charge large commissions is that they have to finance every college in Dakota and Mississippi and North Carolina and Minnesota and California. The

amount of money which goes out of New York to every college throughout the country is astounding. And yet we have been here at the very source of that flood and somehow, somehow, New York has overlooked us.

Now, you alumni have done your duty admirably. You have shown great devotion. There is one thing yet besides devotion for you to bring to bear, and that is to connect in some way, ably, sympathetically, rationally, this great reservoir of money with the needs of your institution. You stand in the very eye of New York, though you are on the Jersey side. You are a part, really, of this great metropolitan community. Rensselaer has recently had a great gift, which is lifting it into larger usefulness and a greater work. The Massachusetts Institute of Technology has come within the last two years to a splendid endowment. I believe that the turn of Stevens is to come next and that in those ten years which now open, we shall see the educational program and the trustee program ripen together. (Great applause.)

The Toastmaster: Between two trustees we are going to have a canoe trip, an excerpt from "The Blazer Girl," Mr. Trewin and Mr. Kay, accompanied by Mr. Russ on the piano.

(Parts of the 1913 Stevens Show were then given.)

The Toastmaster: And Dr. Humphreys says he is going to make engineers of these fellows! (Great laughter.)

The greatest gift in the world, perhaps the most important, is the ability to choose the right man for the right place. I may say the second greatest gift is that of being a prophet. We have a man who combines these two great qualities and he is a trustee of Stevens. He knows how to pick men. Five of them are sitting here; (pointing to one of the guest tables) another will be traveling to Washington in a few more days—the fourth of March. (Applause.) You will find a brief sketch of this man in the Morton Memorial

volume. It reads like a fairy tale. A colonel at twenty-one; managing editor of a New York daily at 25; (hesitating and looking at notes, amid laughter); a builder of railroads —It is a long list to choose from gentlemen—*And* another doctor. He needs no introduction, but I will be prophetic to this extent, to say that you will enjoy the next five minutes, for Colonel George Harvey will address you. (Great applause.)

Address of Colonel Harvey: *Mr. Chairman, Ladies and Gentlemen*—If you will permit me, I wish first to make an announcement. I am authorized by the trustees to say that as a slight evidence of their recognition of this anniversary, they have commissioned the foremost portrait painter of America, Mr. John W. Alexander, to do a portrait of President Humphreys, to be presented to the Alumni Association, in the hope that they will hang it in Stevens Castle. (Great and long-continued applause.) I direct your attention particularly to the fact that that is an announcement. I have five minutes and I want them all. (Great laughter.) I wish it distinctly understood further that I am not responsible for this quoting the "Blue Book" on the part of your toastmaster. (Great laughter.) The lighting may be calculated to a nicety, but it seems to apply to all except to him. Now, sir, set your clock. (Great laughter.)

The Toastmaster: It is already set, sir.

Colonel Harvey: What Alexander Humphreys has done for Stevens, he has done for engineering; what he has done for engineering, he has done for civilization; what he has done for civilization he has done for humanity, for all that makes life worth living. (Great applause.) He is a living examplar of the great truth that the way to render common service is to render specific service. (Applause.) It is not the indeterminate striving of the collective body, but it is the combining of the works of

individuals that gets results, fulfils aspiration, realizes visions. You engineers design a great bridge; you glory in your accomplishment as you should, but whence do you derive your greatest pleasure, your greatest satisfaction? From the honorarium, from the reputation you attain, from future advantages foreseen? No, the sentient thrill of your heart springs from seeing with your own eyes the gossamer threads of your own imagination translated into great cables and bands of steel.

Back of the real is the ideal. The actuality is the mere physical expression of the creative longing that is sunk deep in your heart, in the best part of your nature and sings with the joy of a Beethoven upon its realization. That is why your profession is of the noblest, because it makes for a perfect blending of utility and beauty, of service to mankind, of tribute, if we may say so, to the God within ourselves. But while your unconscious aim is to the abstract, even the mystical, your doing is concrete, definite, precise. That is the science of it; that is the American of it; that is the Stevens of it; that is the Humphreys of it. (Great applause.)

That is why we are here to-night, to celebrate the unselfish service of ten of the best years of his life. That is why he is here to see and hear—mostly hear—us celebrate it. But it is our privilege and our pleasure upon such an occasion to show our appreciation of him and of what he stands for.

Everything, after all, depends upon the man. We may and should urge the common cause, but it is contrary to all our beliefs, theological, political and personal, to assume that we can achieve the common good except through the exertions of the individual unit primarily for individual ends. It was not the mass, but the man whom God created in his image. It was not collective but personal responsibility that was imposed upon the people by the Pilgrim

Fathers. Not numbers, but brains, have triumphed in recent wars. It has been said, and probably is true, that any existing nation would be atrophied by the withdrawal of 10,000 of its best minds. Why? Because the vast majority of men still lead automatic lives and contribute only force, which serves no better than an idle engine unless directed.

The notion of all members of the human race participating share and share alike in its total products is pleasing no doubt, but it is the theory of mediocrity which meets ability, reason and competition and invariably seeks undue advantage. (Applause.) That is why socialism is not an ideal state, but a morass of congealed inferiority (applause), a resting-place for sloth, a burial place for aspiration. What does the apparatus amount to until you turn on the current? It was not to the machines of destruction that Nelson sent his famous message, that Lawrence cried out in the agony of death, that Dewey gave his quiet order. It was to the man behind the gun. And so it is always. When we have done with formulating admirable theories, done with contemplating blissful visions of common service for a common good, we can but awake—awake sometimes with a start—to a realization that the one force we have to reckon with and the only force we have to rely upon is groping, faulty, perverse and selfish, but noble and divinely human, Man. (Applause.)

We know only what we read of heaven. It may be all that it has been depicted or, as Mark Twain hopefully suggested, a mere haven of refuge from one's relations. (Laughter.) We know even less of the other place except as our observation indicates it is a congenial abode for those gregariously disposed. What we do know, what we do know—and I say this with peculiar gratification and with the image of Alexander Humphreys very vivid in the minds of us all—what we do know is this: The greatest thing in

the world, sir (turning towards Dr. Humphreys), is a Man. It always has been; I guess it always will be. (Great applause.)

The Toastmaster: On the third Wednesday of September in 1871, a small band of men—I may say, immortal men—stood at the door of Stevens Institute of Technology to receive the first of her students. There were eight in that little party. Their names are: Henry Morton, President; Alfred Mayer, Robert H. Thurston, Col. H. A. Hascall, Charles W. MacCord, Albert R. Leeds, Edward Wall, and Charles Frederick Kroeh. That was the original Stevens faculty, and Professor Kroeh is here to-night to say a few words to us. Professor Kroeh. (Applause and cheering greeted each name.)

Address of Professor Charles F. Kroeh: *Mr. President, Mr. Toastmaster and Friends*—On the 28th of November last I announced to my family that I was going to celebrate the day. They objected, saying that it was not my birthday, but I said, "Oh, yes, it is, only it takes higher mathematics to recognize it, for on that day I shall celebrate my sixty-six and two-thirds birthday." (Laughter.) It isn't by any merit of mine that you still have me on your hands as a remnant of the original faculty, because I was the youngest member when we opened our doors in 1871. It was rare, that privilege that I had of coming into fellowship and association with men who had already won their spurs and getting into an atmosphere of culture, of original research, of mutual helpfulness and of high ideals. Now I am the only one left, and upon my feeble shoulders rests the burden of upholding their traditions.

What floods of recollections well up in our hearts when we hear those names that have just been read to you: Henry Morton, Alfred Mayer, Robert Thurston, Albert Leeds, DeVolson Wood—for Professor Hascall was with us only a very short time. They have gone to their reward,

and there are two members of the original faculty left besides myself, who are in retirement and enjoying their well-earned rest as well as the increasing infirmities of old age permit. I am proud to be the bearer of a message to you from them, and with your permission, Mr. Toastmaster, and hoping that it will not be added to my five minutes, I want to read to you what they say.

Professor Charles W. MacCord writes: "At the coming dinner I beg through you to congratulate Doctor Humphreys upon the results of the first decade of his presidency, during which time the Stevens Institute of Technology has acquired a noble dormitory, refectory and athletic field, all of which are due to his efforts. May the next decade be equally abundant in good works." (Applause.)

Professor Edward Wall writes: "I congratulate you all, for all have had their part in the growth and development of the Institute. By the inspiration of wise leadership and the cordial coöperation of undergraduates, professors, alumni and friends, a degree of accomplishment has been made in less than ten years, which would have been a creditable achievement if made in fifty years. To the undergraduates I want to say: Some of you have begun to hear voices from the future. I am not so old, but I have forgotten when I first heard those voices, and when my sons grew up and went out into the world, they also heard these voices from the future, and I, through sympathy with them, heard them also, and now in imagination I seem to hear the voices that are calling to you. All the voices are not the same, but the substance of their message is: achievement, possession, success. To all of you I want to say, in the words of Emerson, 'Go forward boldly and take what you want, but pay the price; pay the price in industry, pay the price in integrity, pay the price in unselfish purpose to better the condition of those that you can influence, for, be assured, the permanent possession and enjoyment

of what you desire are to be purchased at no lower price.'" (Applause.)

Gentlemen, it is a good and pleasant thing for us to come together on this occasion to honor our dear president, who has given us the greater Stevens by his ten years of distinguished service; to cement the old friendships; to form new ones; to talk over your golden student days; to congratulate each other upon the share you have had in the amazing prosperity of this country. The human mind is staggered in trying to understand the meaning of the billions which measure the value of the fruits of the earth and of the products of industry, and in every department of human productive achievement you mechanical engineers have been an important, yea a necessary, factor.

In the midst of all this prosperity I was going to ask you to look to-night for a moment beneath the surface at those sinister forces of evil which are endeavoring to wreck our civilization, but I am cautioned by the behavior of the light that it would go out upon me as I got into the midst of that very dark picture. So I will leave it out and you can read it in our Congressional Record, the INDICATOR, in full. (Laughter.) As a consistent optimist, I must believe that the forces which are arrayed in behalf of civilization will ultimately triumph and that this country of ours that we love so much will not go the way of many of the prosperous empires of the past.

I was very much struck by a remark I read, which was made by your very able Assistant District Attorney of New York City, Mr. Frank Moss, in reviewing the recent trial of the so-called "gunmen," in which he lays a very large portion of the blame for their misdeeds upon the community itself, and he adds that these men are graduates of high schools and colleges, and that every year a great number of just such men are let loose upon the world. It is a serious charge, and in reflecting upon it I was forced to admit to

myself that whatever progress has been made in mental and physical education during my lifetime, there has been a retrogression in moral training.

It was natural also to think in that connection of what we of the Stevens Institute are doing to place ourselves on the right side of these contending forces, and I was about to say, as I thought them over, that we had several agencies in the Stevens Institute of Technology that are worth mentioning in this connection. We have a student self-government system, by which the students are trained to consider the ethical value of their actions. They are trained to do this themselves. We have fair and square athletics at Stevens. We play a clean game, and I hold that when a student has arrived at the point where he would rather loose an event than gain it by unfair means, he has taken at least one step forward in righteousness. (Applause.) We have two non-professional departments in the curriculum of Stevens Institute in which it is possible to bring before the minds of the students the problems arising in the inner life of man, and we have the irreproachable character of our president and professors and their fair and humane conduct and their human sympathy in and out of the classroom as examples to all the students. Some day I think that the world in general will wake up to the fact that we are training not only for efficiency, but for character.

You know what the greatest financier of modern times said when he was at the hearing of the Pujo Committee. It was found, in answer to the questions put to him, that he laid the greatest importance upon character, and I can imagine a scene like the following occurring in the near future:

A man will present himself at the office of J. P. Morgan & Co. and will ask for a million dollars. The question will be, naturally: "What do you want it for?" "Oh, to pipe

the interior heat of the earth for the sake of supplying Manhattan with heat, light and power." "And what securities have you to deposit for the loan?" "I have none; I need none; I am a graduate of the Stevens Institute of Technology." (Laughter and applause.)

"Ah!" I say will be the answer; "Davidson see that this man gets a check for a million dollars (laughter), and Davidson, while about it, have another check drawn for $2,000,000 and sent to President Humphreys, who has been doing splendid work for the last ten years over there in Hoboken." (Great laughter and applause.)

The Toastmaster: In 1887 a young man graduated from Knox College in Illinois; went out into the world and returned five years later as president of that college. In that way he became the youngest college president of the United States. Three years he then spent at Princeton, where he was associated with Woodrow Wilson as professor of one of the courses. In 1903 he became president of the College of the City of New York. His name is John H. Finley. (Applause.) I think that is enough to make you want to hear him.

Address of John H. Finley: *Mr. Toastmaster, Mr. President, Ladies and Gentlemen*—Reference was made by your toastmaster a few minutes ago to the last number of *Harper's Weekly*. I am devoutly sorry to hear that that is the last number; I hope that it was only the latest number (laughter), and that there will be at least one other number and that it will contain as an editorial or as a contribution the address that was made by Colonel Harvey. (Applause.) I envy a man who can invite or compel—I don't know which it is—I wish he could compel something of that sort in me—can invite such an address as that, and I envy the man who is able to make it. If I don't use my five minutes, I hope he will have what is left. (Laughter.)

You have been told I was once the youngest college presi-

dent in the land. That is the only distinction I ever enjoyed and I have lost that. I am now, sir, one of the oldest living members of the Society of Prexies. I have seen some of them come; I have seen many of them go; I have seen some of them both come and go. (Laughter.) Before Butler and Hadley and Lowell and Hibben were, was I. I was a contemporary of Eliot and Angell and Low and others who have gone on into that twilight zone of a larger disinterested unpaid public service. I was at one time a student of Woodrow Wilson and I was a president long before he was, but now, like Elijah, he has gone up in a chariot, and I stand looking up into the skies. (Laughter.) I was present at the birth of the American university and I witnessed the immaturities of the American college. I have observed a great many other things which I will not relate.

And so I stand, like one of Priam's chiefs upon the walls of Troy, wise with time and garrulous with age, looking upon the exploits of these younger Achilles and Hectors and so on, and I may say, in the words of the psalmist, "I have been young and now am old, but I have never seen the righteous forsaken," nor have I seen a college president begging bread—that is, for himself. (Laughter.) I have seen him begging bread and almost everything else for other people, and I think the most unselfish, altruistic member of this noble order, which is unique in America, the most altruistic member is your president, Dr. Humphreys. (Applause.)

I only hope that you are not going to make him work so hard in the next ten years. Some one was telling yesterday of an epitaph that was written over a man who worked too hard, going about from one place to another, one board to another. This was the epitaph: "He was committed to his grave."

But, sir, if you come to that other world, about which Colonel Harvey seems to have some question—I mean as

to the existence of it, not as to your getting there—if there is such a world, if you should get there and I should be within seeing distance (laughter), I am sure that I shall find that visage to which Colonel Harvey has referred, that visage of a man, I shall recognize your visage as upon or in the bosom of Abraham. I see that you do not understand the reference. You will find it in the 11th chapter of Luke, 25th verse. (Laughter.)

My time is nearly gone. I think that here we have an example (pointing to Dr. Humphreys), one of the finest examples of modern chivalry: a man of gentle urbanity, at home anywhere in the world, but a man with the fine domesticity of suburbanity (laughter), and a man who has the simplicity, the rustic simplicity of one who lives in the country. I bring my tribute to him to-night. He is the first Alexander—you know the first Alexander conquered many worlds and sighed because there were no more—the man who made greater Greece. This man nearly twice the age of Alexander when he died is still longing for more worlds to conquer. This man has already conquered far more worlds than Alexander—worlds of the air and of the water and of the land. And he has performed one great service: he has annexed Hoboken to New York City. (Laughter.) Psychologically, it is now a part of New York; it does not belong on the Jersey Shore; it is only a geological accident that it is separated from us. He is the man who has carried those gossamer threads across the river, for, if our thoughts could be visualized, Colonel Harvey, we should be able to see a bridge over the Hudson River, a bridge over which our thoughts, the thoughts of us who love this man and who admire his work, travel day after day and week after week. There is a great Humphreys bridge across the Hudson River. At one time we thought of Hoboken simply as a place where our friends went when they wanted to embark for the other side of the ocean. Now Hoboken is a

place to which we go over that bridge to disembark our thoughts in Stevens Institute.

I will stop with the only mathematical figure that I am acquainted with, at least that I remember. I wish, sir, that you erect a perpendicular line upon a base. I don't know just how long the base is, but the perpendicular line is ten years high. I hope that the square described on the hypothenuse will be equal to the sum of the squares already described on the other two sides. (Great applause.)

The Toastmaster: Dr. Finley—(here the lights are lowered.)—Here, what is the matter? Turn up those lights! (Great laughter. The lights are turned on again.) Dr. Finley, has reminded me of a little story I read not long ago about Alexander the Great. It seems that once when the general was seated outside his tent he was approached by the drummer boy of one of the cohorts. The drummer boy, with that characteristic directness of drummer boys, said: "Alexander (pointing to the neighboring height), yon castle must be took." (Laughter.) Alexander changed the location of the Hoyo de Monterey perfecto that he was smoking and said: "Boy, yon Castle has been took."

We will now have just a few minutes respite from the scientific management. (Laughter.) That is the first real laugh I have got this evening (laughter), and when we rap for order please come promptly to order, because the scientific management of the committee requires very prompt action. Anybody seen De Hart?

A Voice: Right here, sir.

A Voice: Here he is.

The Toastmaster: Well, hurry up, Johnny.

(Mr. De Hart comes forward and mounts the platform in front of the speakers' table, holding in his hands a model of Castle Stevens under a glass case.)

Mr. De Hart: *Fellow Alumni*—I have here a reproduction of Castle Stevens. It won't hold the painting, but I

trust the Doctor will treasure it and keep it, and we are all presenting it to him here to-night (handing the model over to the Doctor). I hope the Toastmaster will give him five minutes extra. (Applause.)

The Toastmaster: Now, we will make the welkin ring with the song "Dear Old Stevens Tech."

(The song was then sung by all.)

The Toastmaster: We saved about three minutes on that. Up in the wilds of New Jersey in a little town called Tenafly, the Luther Burbank of engineering started his existence more years ago than I think you would believe by looking at him. He entered Stevens in '86; won prizes right and left; was the anchor on the tug of war team; one of our prominent athletes and is still to-day; he has been president of this Association; alumni trustee, and now he has in hand the Graduate Fund, which some of you have read of or heard about. Henry Torrance, of the Class of '90 will speak to you for five minutes. (Applause.)

Address of Henry Torrance: *Mr. President, Guests, Fellow Alumni and Ladies*—I have a short argument and hope you will listen and catch the moral. This intellectual assembly should be fully capable of grappling with all the public questions of this country.

We are confronted with that perplexing problem, the enormous price of food!

A farmer knows how to plow the prairie; James J. Hill knows how to build a railroad; Lloyd-George knows how to tax the people—he thinks he does; and R. T. Crane used to say that a hobo knows how to run a manufacturing establishment. We Stevens men are supposed to be—excuse me, are able—to tackle it all, hence we must know all about food.

We must study the farming conditions of Kansas, the cost of pork on the hoof, the value of a ton of beef, the length of alfalfa root, the compressive strength of a spear of winter

wheat as it forces its way upwards through the snow and ice, for Kansas wheat will grow through anything, and thus enable ourselves to figure accurately the cost, the intrinsic value of lobster à la Newburg. How much do the iniquitous hotel men charge us for it?

Kansas largely controls the price of food. Kansas farm land in 1880 was $1 an acre, twenty years ago was $15 and now is $200, and the farmer will tell you it is because the season has changed; that there is more rain because the country is populated. He will want to sell you cheap land in western Kansas and promise rain when the country is settled. (Laughter.) Now, fellows, I have been there and they have all told me that.

Does that sound reasonable? The Kansas prairies were the homes of the buffalo; covered with buffalo grass with a sod three inches thick, woven so closely that it was actually used to make hard bricks and to waterproof the roofs of houses like the thatched roofs of Japan.

There was plenty of rain on the prairie, but it ran off to the ditches—didn't soak in. The air on this short parched grass in summer became as hot as that on a Hoboken tin roof with southern exposure. Who found it out? Why, a Stevens man who could not sight his transit because of the hazy heated air. Every year, in August, a trade wind would arise and three days in one direction was enough to drive the heated air from these vast prairies, scorch, burn up and devastate every crop it touched. Crane's hobo, who didn't know anything, said: "'Tis useless, my crop is ruined every year; I will let the eastern capitalist foreclose the mortgage," and that was twenty years ago, and the *New York Sun* tried to find out what was the matter with Kansas, but the Stevens man said, "I will plow up the prairie and stop that heating of the atmosphere," and he plowed it.

When the Stevens man could not make his transit work he

sat on a rock to think, and his name should be placed in the farmers' hall of fame alongside that of Sir Isaac Newton, who saw the apple fall. (Laughter.) Stevens men are taught to think by Dr. Humphreys.

Ten years ago the farmers of Kansas were populists and Bryanites. They wanted "free silver" but were given free gold instead by the Stevens man. I could tell more about Kansas, but I haven't the time.

The *New York Sun* said, "What's the matter with Kansas?" That's what William Allen White wanted to find out. The matter was they had a gold mine right under that buffalo grass sod and never knew it; and we have a gold mine under our Stevens education, and it cost more than we paid for it.

In 1870 Henry Morton and S. Bayard Dod planned this school of engineering, the first in the country, and the scheme of the first catalogue of 1871 has never been changed, though much enlarged by Dr. Humphreys.

We were taught patience. We had to turn a steel bar down in the middle to the size of a knitting needle without breaking—something like that (holding up a thin wire); that is what we had to do (laughter); and if our vigilance relaxed, it was zip! "busted"! and we had to make another. My partner, Buck Lawrence, broke our bar and I was the "goat." (Laughter.)

We turned Hawkridge's iron; the price was figured by the pound, but being full of blow-holes, he charged us by the piece. (Laughter.)

We took the temper out of chisels on the wood lathe. I did. A freshman wanted to know why the end of the chisel got blue and Lackland said, "The heat of your enthusiasm did it." (Laughter.) That is the gospel truth, fellows.

When we chiseled iron at the vise bench, Lackland said, "You must look at the iron and not at the chisel," and you

ought to have seen us pound our thumbs. (Laughter.) Mine is sore still.

We had to calculate the gears on a milling machine. De Volson Wood was giving us composition in English and Lackland wanted to give us problems in mathematics, and that stuck us. (Laughter.)

In pipe fitting Louis Becker said: "You cut the threads; it is fun for you and damn hard work for me." (Laughter.) So we sweated at the pipe bench.

Calculus taught us that a tomato can using the least tin had a diameter equal to its height. (Laughter.) Did you ever know before why the height was equal to the diameter?

When we drew a line, Webb told us to look at the point we were aiming at and not at our hand.

Fellows, we must keep our eye set on the goal we are aiming at. We must maintain this institution the best in the country, amply endowed and pass it to the next generation even more than we have received. (Applause.)

The first job we had in "Lab" was pasting new labels on bottles, and it was a tough-looking set that '89 passed on to '90. Professor Stillman gave me barium sulphate to analyze, and I fussed three weeks dropping in the ammonia, but got no results; then he dumped in the bottle, it turned white and he laughed at me. (Laughter.) I did not add enough to counteract the acid.

The predominating quality dominates the rest, and the good in the Stevens man will keep down the bad—in the other fellows.

But the good old days are past. The sulphur fumes are taken off in the Morton "Lab" ventilating pipes and the Honor System is established, and I say that if Dr. Humphreys had done nothing whatever for this institution except establish that Honor System, his ten years here would have been well spent. (Great applause.)

Dr. Humphreys teaches principles, not details.

Will Mike Murphy teach you to run? Yes. Will he teach you the science of it? No, he keeps that to himself, but Dr. Humphreys does not; he will tell you that your body is to advance horizontally, that the up and down motion wastes energy and loses speed.

Spalding's book on how to bat says: "Keep your eye on the ball, keep your nerve and hit where the other fellow isn't." Does it tell you the science of the swing with your bat between your eye and the ball so you can see what you are doing? No, but Dr. Humphreys does.

Across the river we see that land on Castle Stevens Point. The buffalo grass there still sheds the water and the hot sun and trade winds from the Hoboken tin roofs still form the devastating breezes. But we have about us philanthropic bankers who will surely lend us money without interest to buy this land. We will concentrate our Stevens intellect upon it, the sod will be turned under, the rain penetrate, the grass grow, the flowers blossom and lofty Stevens buildings with colonnades and ivy vines will rise up as monuments to the second ten years of Dr. Humphreys' reign. (Great applause.)

The Toastmaster: The next speaker, I understand, is not a doctor, but in recognition of his scholarly attainments Princeton University has conferred upon him the honorary degree of Master of Arts. He is the father of the Pilgrim Society, which does more perhaps to promote good feeling between this country and England than any other single force. He is second vice-president of the Equitable Life Assurance Society and a friend of our honored president. I take pleasure in introducing Mr. George T. Wilson. (Applause.)

Address of George T. Wilson: Mr. Lightning-Change Artist of a Toastmaster, distinguished and beloved guests of honor and other guests more or less distinguished or extinguished, like myself, who through the very mysterious

but most benign dispensation of providence, have been enabled to break into the bread line of the Stevens Institute to-night; angels that are bright and fair looking down upon us from up there (laughter), about whom a recent poet wrote: "Here's to woman, the power behind the throne; God save the king!" (great laughter); manufacturers of steel, iron, steam, gas and all the other commodities which go to make the high cost of loving—living of the present day (laughter); fellow citizens; graduates of Stevens;—I give you my cheeriest greetings, express the hope that you are feeling just as good as you look, and thank you from my heart for your kindly reception, which comes to me very much like a refreshing cock—tonic. (Great laughter.)

I am reminded of the story of the little girl who was so tired one night and who asked her mother not to make her say her usual long prayer, but to let her off with the short prayer that nursie said every morning. "And what is the short prayer that nursie says every morning, my darling?" "Oh, Lord, have I got to get up?" (Great laughter.) That is the swear—prayer that is chasseeing up and down and all around my spinal system as I rise to the "call of the wild," realizing my utter inability to rise to the occasion.

In a city court the other day the judge sternly ejaculated: "The next man that interrupts the proceedings of the court will be ejected from the courtroom!" Whereupon the prisoner in the box arose and said: "Wow! Hooray! Hi! Hi! Now, judge, let me go." (Great laughter.) I have a fellow feeling for that prisoner, and I should just like to say: "Wow! Bully victuals! Dr. Humphreys, we love you. Now, let me go?" (Laughter.)

If I had the felicity and the facility of speech of the other George—Harvey—I would rise to heights of eloquence perhaps that would rouse you to irresistible enthusiasm—maybe — but as I haven't his command of language and none of my

own, and in view of the speed limit, the chief merit of my remarks will be their brevity.

It has not been my good fortune to enjoy the acquaintance of Dr. Humphreys in that capacity which would enable me to address him as so many of you do so beautifully and harmoniously to-night, straight from your heart of hearts, as "Dear Old Prexy," but it has been my good fortune to associate with our guest of the evening as a business man and as a gentleman in the truest and sweetest and dearest sense of the term. (Great applause.) And, taking the liberty of speaking for his business associates, I would say that they think of him as the equipoised personality of wisdom, wit, gravity, gaiety, the harmony of conflicting emotions. And another nugget: the paradise of reason, temper, urbanity, all the virtues set off by all the graces. I have some other nuggets concealed about my person. (Great laughter.)

I know this "glim" will be "doused" any minute on me, and I must hurry along. Students, graduates, friends, business associates, we all think of dear Dr. Humphreys as an old friend. And you remember what the Autocrat of the Breakfast Table sang long ago:

> There's no friend like the old friend
>   Who has shared our morning days;
> No greeting like his welcome,
>   No tribute like his praise.
>
> Fame is the scentless sunflower,
>   With gaudy crown of gold,
> But friendship is the breathing rose
>   With sweets in every fold.

And so, Dr. Humphreys, we bring you to-night the rose of friendship, fragrant with the memories of the past, glowing in the doings of the day, bright and hopeful in the expectancy of the morrow and sweets in every fold. And as Mr. Shakespeare once wrote about you: "His life was gentle and the

elements so mixed in him that nature might stand up and say to all the world, This is a man."

The other day a fellow tripped going down the Thirty-third Street entrance to the subway; on his downward flight he bumped into a girl, who landed on his chest and went down with him. (Laughter.) When he got to the bottom of the stairs, she made no motion of getting up, and he respectfully said: "Madam, this is as far as I go." (Great laughter and applause.)

The Toastmaster: The light will always shine on George T. Wilson. In introducing the poetic vein, I certainly struck a popular vein as well as some other kinds of vanity. We will now have the second excerpt from the "Blazer Girl." The gentleman's name is actually Milligan; I can't tell you what it is on the stage, because I have forgotten it.

(Further extracts from the "Blazer Girl" were then given.)

The Toastmaster: Eighteen years on the Faculty of Stevens, think of it! and a young man, too; five years in practical electrical work before he went to Stevens, but he got through the four years in three; that is, he did not take the first year. I am going to let him speak to you five minutes Albert F. Ganz. (Applause.)

Address of Prof. Albert F. Ganz: *Mr. Toastmaster, President Humphreys, Fellow Alumni and Guests*—I deeply appreciate the honor of representing the Faculty on this important occasion, particularly as I have been asked to speak of President Humphreys' great work for Stevens.

When ten years ago we lost our revered President, Dr. Henry Morton, who had so ably guided Stevens to its position of prominence among the colleges of mechanical engineering, the name of Alexander Crombie Humphreys came at once to the minds of Trustees, of Faculty and of Alumni, as that of the one man eminently qualified to continue the work of Morton. Already imbued with the traditions and

ideals of Stevens as the result of his close association with Dr. Morton and of his untiring and unselfish work for the welfare of Stevens—his own Alma Mater—he accepted the unanimous and urgent call and became our executive and leader, in the face of great personal sacrifice.

He soon found that the extremely rapid growth of engineering in many directions, and the increase in the number of applicants for admission, made imperative more equipment, enlargement of space, extension of courses, and an increase in the instructing personnel, over what had sufficed in the early days of Stevens. How ably and how successfully he has met these demands! The old buildings were reconstructed and extended, giving more adequate shops, a fine auditorium, greatly improved lecture rooms, and additional recitation room; the Morton Laboratory of Chemistry was also added. Ten years ago the Faculty consisted of nineteen members while to-day there are thirty-one, seven of whom remain from the former nineteen. The additions to class rooms and Faculty have made possible greater subdivision of classes whereby the efficiency of instruction has been increased, and a closer contact between students and instructors has resulted.

Himself a man who had attained eminence not only as an engineer, but also as a business executive and financier. President Humphreys recognized the necessity of giving training in business affairs to engineering students and to meet this demand introduced a course in Economics of Engineering under his direct personal charge, and thereby made Stevens the first college of mechanical engineering to require work in economics in its curriculum.

Realizing the great importance of providing a suitable environment for improving the physical and the social welfare of our students, President Humphreys, against almost insurmountable difficulties, acquired the historic Castle and a large portion of the Castle Point grounds.

His high ideals and his inspiring personality have impressed themselves upon all, and have developed a spirit of coöperation between Faculty and students which has resulted in the introduction of a most successful system of student self-government—a plan which fosters honesty, self-reliance, and manliness in our students. Incidentally the honor system, a part of the self-government plan, has relieved the members of the Faculty from the very unpleasant duty of keeping watch on students, especially during examinations, which are now conducted without any Faculty surveillance whatever.

Influenced by this spirit of coöperation student organizations have greatly developed and most of these have become influential and important factors in the student life.

President Humphreys' continued unselfish sacrifice of his time, his personal comforts, his resources, and even his health—all for the benefit of Stevens—have been a constant source of admiration and an inspiration to the members of the Faculty, who know that in President Humphreys they have a sympathetic executive who will give them all possible aid within his power to enable them to do their work with the greatest thoroughness.

During the past ten years the development of all of the engineering branches has continued at a remarkable rate, as you all know, and correspondingly greater demands are made on colleges of engineering. To meet these increasing demands so that Stevens may hold its own in the future as it has in the past, we must have additions to our laboratories, equipment and resources. In Castle Point we have an absolutely ideal site for those extensions and we earnestly pray that President Humphreys may soon be successful in his efforts to secure the financial assistance which will enable him to provide the necessary extensions and to realize his plans for a greater and still more useful Stevens.

President Humphreys: The members of your Faculty are not content to have their high appreciation and regard for you merely recited on this occasion, but have prepared a testimonial of their esteem in this permanent form which is signed by every one of its members.

On behalf of the Faculty of Stevens Institute of Technology, it gives me, Sir, the greatest pleasure to present to you this testimonial of their appreciation of your work. Pray believe that this testimonial is not a mere formality, but that every word recorded in it comes from the very bottom of our hearts.

(Professor Ganz then read the testimonial.)

Alexander Crombie Humphreys:

On this occasion, the Tenth Anniversary of your Inauguration as President of Stevens Institute of Technology, we the Faculty, desire to congratulate you on your successful administration and to formally express our appreciation of your valued services to your Alma Mater.

You have brought about a hearty coöperation between the Faculty and the students which has led to a successful student self-government system. You have greatly increased the efficiency of the course of instruction by coördinating more completely the work of the different departments and by establishing, in anticipation of the demands of the times, a department of Economics of Engineering which under your charge has had the benefit of your wide experience in business affairs.

Your activity and prominence in the educational and the engineering circles of the nation have greatly added to the prestige of Stevens.

Your wise forethought and untiring efforts have enabled you to secure historic Castle Point, the possession of which has contributed to a fuller development of physical and social life, and has made possible a Greater Stevens.

Inspired by your personal sacrifice and your deeds we pledge to you our continued support and loyalty, and earnestly pray that for many years to come we may enjoy the advantages of your leadership.

Presented at the Annual Alumni Banquet
Hotel Astor, New York, February 14, 1913.

(Great applause.)

The Toastmaster: The Class of 1906 bears the distinction of having been the first class to graduate under Dr. Humphreys after four years under his teaching. The permanent president of that class is Mr. James E. Pinkney, the son of a former superintendent of the United Gas Improvement Company, a man who during his undergraduate work was active not only in athletics—he played three years on the 'varsity football team and on the 'varsity lacrosse team—but also in other undergraduate affairs, and particularly those relating to the establishment of the Honor System. You will be pleased, I am sure, to hear from Mr. Pinkney, who represents the younger graduates of Stevens Institute of Technology. (Applause.)

Address of James E. Pinkney: *Mr. Toastmaster, Mr. President, Fellow Alumni and Guests*—As the Class of 1906 entered the Institute at the time Dr. Humphreys accepted the responsibilities of President, we were the first class to take the entire four years of the course under his direction. It is as a representative of 1906 as well as of those classes that were graduated during the first four years of his presidency that I now have the honor of addressing you. And as I stand here to-night it doesn't seem one bit natural for me to feel really honored in representing 1905 and 1907. In the good old days of yore it was far from such, believe me. How about it, 1906?

Those were the days when we would gather in groups in the true college manner, and after giving the class yell, we then

most enthusiastically delegated those beloved names to that fiery place of eternal brimstone and sulphur. But those petty controversies of undergraduate days have long since been forgotten and we gather here to-night to do honor and pay homage to the man who has done so much for Stevens and our Alma Mater, the dear Old Stone Mill.

The early days of Dr. Humphreys' administration were days of many little misunderstandings. I can well remember how the various fellows accepted Dr. Humphreys' remarks on what he expected of us, what we might do and what we must not do. Most of us believed part of what he said; part of us believed most of it; there might have been a few who believed all of it. But there was only a short time, a very, very short time before all of us, every blessed son of us, from the freshest freshman of my own class up to the sage of the senior class, realized without the shadow of a doubt that whatever Prexy said he meant and he meant every word of it, too.

As underclassmen we respected Prexy for his great success and reputation in the engineering world, and as we continued in our course we came to know him better and learned to like him for himself alone, for the man that he was, the big, broad man that we all loved.

It would require a man of more eloquence than I possess adequately to sing our praises of Prexy, but whatever has been said to-night, no matter how eloquently expressed, has not been spoken with any more sincerity and earnestness than that with which I am speaking. So let us all, from the last graduates of 1912 back through the ranks of the Old Guard, let us all get together and more loyally show our appreciation of what Prexy has done for us. We may not have much in money—few of us have—but we all have time and energy with which to support and encourage him. Prexy, good old Prexy, always was and is "from Missouri." Let us show him then that we are with him to a

man, heart, soul and body. (Great applause and cheers from the class of 1906.)

THE TOASTMASTER: We had a song scheduled for the next thing on the program, but the hour is getting late and we will omit it, and I will introduce the next speaker, Mr. J. H. Vander Veer, of the Class of 1913. This is another unusual thing we are doing to-night. The entire Senior Class is here, joining with the alumni in honoring Dr. Humphreys on this most important point in his career and in the career of Stevens, and Vander Veer, who is the president of the class, is perhaps particularly well fitted to speak for the undergraduates, because he is representative of the undergraduate activities. I know that you will be interested to hear him. (Applause and cheers.)

ADDRESS OF J. H. VANDER VEER: *Mr. Toastmaster, President Humphreys, Alumni and Guests*—On behalf of the Class of 1913, and in reply to the telegram which the Toastmaster has read to-night, I wish to state that the Faculty has failed to weed out a single member of the class at the recent examination. We have therefore no recruits for the Agricultural School. (Applause.)

The undergraduates are perhaps in the best position to appreciate what President Humphreys has done and is doing for Stevens. To our minds the Morton Laboratory is the last word in chemical laboratories. It is hard for us to realize the difficulties which formerly prevented athletic practice, and those of us who have journeyed with the teams to other colleges know that there is no finer athletic field in the vicinity of New York than Castle Point. The greatest boon to the undergraduates is Castle Stevens. The facilities which this historic building offers as a center of student life are doing wonders towards strengthening that college spirit which has always been so prominent a characteristic of the Stevens graduate. It is our good fortune to have the personal instruction of President Humphreys in

business engineering, accounting, depreciation and the economics of our profession; and while it is as yet hard for us to appreciate the full benefits of this instruction, the high standing of President Humphreys in the business world indicates that it will be the most valuable part of our education.

A feature that President Humphreys has done a lot towards is our student self-government. Student self-government at Stevens was first applied to the conduct of examinations, but the plan has worked so well that it has since been broadened until at present we are organizing a student self-government, to be composed of the officers of each class and the heads of the various student activities, which council shall have general supervision of all student interests at Stevens. All roster work is performed under an Honor System. Each student is placed upon his honor as a gentleman in the performance of classroom, laboratory, examinations and home work. Examinations and written tests are conducted without Faculty surveillance of any kind, but each student is required to sign the following pledge: "I pledge my honor as a gentleman that I have not applied for help and that I have neither given nor received help during this examination." The rare infractions of this honor system are investigated by an Honor Board composed of representatives elected from the four classes, and the offenders are either acquitted or referred to the Faculty for discipline.

The effect of placing the students upon their honor has been to almost entirely eliminate cribbing, and it is a source of great satisfaction to us to feel that we are respected and trusted to be gentlemen. I therefore wish to take this opportunity, on behalf of the undergraduates of Stevens Institute of Technology, to thank President Humphreys for all that he has done for us and to wish him continued success in carrying on the work which is so dear to him. (Great applause and cheers for Vander Veer from the Senior Class.)

The Toastmaster: A perusal of the speakers' list and a little reflection will indicate to you the futility of the next duty which falls to the Toastmaster. I am to *introduce* to you Doctor Humphreys and I am at a loss as to how to do it. You know him well. Rather I think I will turn the thing about and try to introduce you to Doctor Humphreys. These men, Doctor, have come here to-night at this most remarkable point in the career of our alma mater to testify to their belief in you. They look to you as the leader of this movement for a Greater Stevens. They like to hear you tell them about it. They don't want you to tell them that you are a "poor beggar," because they don't believe it. I now ask you to address them, as the last speaker on this remarkable list. (Great applause as the whole assemblage rises and cheers for Dr. Humphreys.)

Address of President Humphreys: *Mr. Toastmaster, Alumni and Friends*—There are many of you here to-night who know that speaking at any time is not an easy task for me, and I ask you to believe that it is almost impossible for me to speak to-night. I knew, of course, that this dinner was to be given in my honor, and I anticipated that, while it would have much of pleasure, it would have much of embarrassment for me. For me the evening has been full of surprises. The announcement made by Colonel Harvey came to me most unexpectedly. This model I knew nothing about. The resolutions of the Faculty were a surprise.

I have prepared for to-night at the solicitation of our Publicity Committee, an admirable speech. (Merriment among the audience.) It is in the hands of the press—to do with as they please, as they generally do. (Laughter.) But I am afraid that that speech would not be appropriate at the present moment. I can, I suppose, try to cover my embarrassment and try to keep down the feeling that is moving me by referring to material things. You have all of you, I believe, before you the plan of what we hope is the

enlarged Stevens, prepared by our official architects. I find that in many cases this plan is not understood. Some, I believe, have even wondered how we were able to erect all these buildings. That you may not be carried away with the idea that we have any such plant as is shown, I would say that of the many buildings that you see on this plan, the following only are to be found at present, namely: 1, which is known to you older men as the "Old Stone Mill"; 2, the Carnegie Laboratory of Mechanical Engineering; 3, the High School Building, which now includes what it did not include in the time of the older graduates, lecture rooms also for the Institute, so much needed when I took hold; at that time there were eight professors who did not have lecture rooms and were kicked from pillar to post in their efforts to teach the boys. Then, the Morton Memorial Laboratory, which I do not hesitate to say is second to nothing of the kind in the United States, certainly for teaching its particular specialty. Then we have the Stevens Castle. Then you will find No. 29, which is the Delta Tau Delta Fraternity House, the only fraternity house so far on the grounds, though four sites have been sold to other fraternities under restrictions. And then we have the gate erected by the class of '97; with the grandstands which also have been erected, though not on the scale shown in the plan.

It is not true, however, that we have the land even that you see on this plan. I believe that many of the alumni think that in acquiring the Stevens Castle, we acquired all the land surrounding it, including that lawn. The fact is that, if you take as a point to fix your attention upon, No. 14, the prospective water tower, that stands upon the land of the Robert L. Stevens estate, upon which we hold an option, and that land in the form of a triangle runs down to about 41. Then there is the land on which you find 6, 7 and 4. We own and have owned since our twenty-fifth anniversary, the most northerly portion of this block, across

River Street from the Institute. The balance of it is still owned by the Hoboken Land and Improvement Company, upon which we have a practical option. To purchase both of these pieces of land will require about $200,000. We still owe about $200,000 on the land that we hold deeds for. But I don't want to talk finances to-night, though I do hope that the means will be given to us to carry out the plans outlined for I do honestly believe that we have a most unusual opportunity to enlarge our work and our service. The site that we have there is second to none in the country, and I almost question whether there is another site like it. A man whom I consider one of the greatest authorities in the United States on education, Dr. Pritchett, has examined it carefully and has unhesitatingly given that as his opinion. The question is, Can we carry out our plans? Not with the idea that all these buildings shall be erected in one year or two years or three years, but we feel that we should make a general plan in advance, so that as the means come to us we should not make the mistake of placing a building where afterwards it would be in the way of other buildings, and that the development of this magnificent site would go along well-ordered lines without interference as to the activities of the future.

A good deal has been said with regard to the honor system and student self-government. I am a firm believer in the principle of honor government as applied to the student life, and I believe the man or the boy who is expected to do the right thing will be the more inclined to do it, if we give him the opportunity. There are, necessarily, in every college men who will cheat, men who will not be true to the ideals which are set before them; but I do believe that many a man who would otherwise cheat will not cheat, if he is put upon his honor and is expected to do the right thing. That has been my experience. When I took hold of Stevens Institute of Technology, it wasn't for me to say that the

students should start that self-government board or that they should introduce the honor system. It was necessary that the plan should come from them; but I did in my first address, in September of 1902 tell the undergraduates that I hoped the honor system would come; and if I recollect aright, it was the Class of 1906, which has been so ably represented to-night by Mr. Pinkney, who first had the opportunity and had the courage to come and ask me that they should in their senior year, when about to graduate, be given the privilege of trying it out; and we granted them that privilege. And then the system gradually spread. For some time it was thought by members of the Faculty that it would be a dangerous thing to apply to the freshmen, but I felt that it should be applied to every class. We have applied it to every class; and while, of course, there will be times when we are disappointed in the men, the test is illustrated in the following experience: In my earlier days as president, I was in the habit of asking some of the prominent men of each class as they were about to graduate, but after they had passed their final examinations, and therefore were at liberty to speak freely, to criticise our methods and especially to criticise my methods. I had five or six of these men before me, and I was asking them how they felt that the honor system was working. All except one spoke favorably; the last man said he did not believe in it. I asked him why. "Well," he says, "there is some cheating." I said, "Is there more cheating now than there was before?" "Oh, no," he says, "a great deal less, but," he says, "it is much harder to get high marks." (Laughter.) Well, I thought that answered the question the way I wanted it answered. I do not think that there has ever been a thought in the minds of any of our Faculty of going back to the old system, and there certainly never will be a movement in that direction with my support as long as I am President.

I find, as we discuss matters with our student body, that

while, of course, there is dissatisfaction, at times there is criticism of the Faculty (there is some now), that when we take the matters up and discuss them candidly and honestly with the students, as a rule our troubles are straightened out. Of course, we take the ground that the highest power rests with the Faculty and the President, and that while we will make every effort to conform to their ideas, if we do not succeed in that direction, they will conform to ours. (Laughter.)

I have had two or three very delightful experiences in the last few weeks in the direction that I speak of, where, simply by taking up the questions that have arisen, taking them up frankly with the students, those troubles have certainly been minimized, if not entirely eliminated. I had a very delightful experience lately with the gentlemen now facing me at the back of the room. The undergraduates as represented by the Senior Class—and I am glad to hear from their president that none of them has been weeded out in the last examination—surprised me very much by asking me to take part in their final annual dinner as undergraduates. I told them that they would have a better time without the dampening influence of my presence, but they thought not, and I went there and I was delighted that I did go. There were some little questions, I think, amongst those men as to whether we were treating them right, and I hope—and I trust that the men I am facing now will agree with me when I say—that when that meeting broke up—which was pretty late—we had come to know each other better, and that some of the troubles had been eliminated. There was a delightful frankness in the expressions of opinion by those speakers that preceded me. I was first on the list of speakers according to the program, but the Toastmaster told me I might take my position at the end of the list, so that I could reply to the "roasts" that I was to hear (laughter), and I heard lots of them, but tactfully presented, and the last "roast"

was for me, but it was not delivered, because the gentleman who spoke for or at the Faculty said that when he was invited to make his speech, he didn't know that Prexy was to be present, and therefore he would respectfully ask permission to omit that portion of his remarks. I advised him to print them. He said he expected to *after he graduated.* (Laughter.)

Now I wish that I could really say all that is in my mind and in my heart with regard to the reception you have given me to-night. I do want to say something that I think I have said at nearly every meeting of the Alumni since I have been President; I don't believe there is a college president in the United States who is more loyally supported than I am by our Alumni; and hard pressed as I have been to carry on the work of the Institute, with an increasing deficit year by year, which has now rolled up to some $125,000 through five years, I haven't the slightest doubt that if the Alumni had the money, I never would have to ask a dollar outside, and as I have said to the management of the Alumni Association repeatedly lately, I deprecate any step that is taken towards asking from the Alumni another dollar until they have been given the opportunity to recover from the efforts they have already made to support me in my administration. So I will conclude by thanking you, the Alumni, and thanking you, the friends, that have come to take part in this, shall I say, tribute. But I won't conclude till I say this: that I don't believe for one minute that I am worthy of all which has been said to-night, but I will say this, something that the District Attorney of New York County, Mr. Whitman, said at a dinner recently given to him and which I attended. He said: "I have not been able to do the things with which you credit me, but I will claim this credit; I have tried hard to do them." And that is what I have done. (Great and long-continued applause and cheering.)

The assemblage then dispersed, at 12.05 a. m.

ALUMNI DINNER TO PRESIDENT HUMPHREYS

Following is a list of alumni and invited guests who attended the dinner:

Ackerman W. S.
Adams, Harry H.
Addicks, Walter R.
Agens, Herbert Mortimer
Ahrnke, H. P.
Alden, J. W.
Alexander, Charles B.
Alexander, William
Amberg, Joseph John
Anderson, R. M.
Anderson, R. T.
Appert, H. J.
Aronson, P. R.
Aspinwall, John
Atwater, C. G.
Austin, J. A.

Backer, L. H.
Backus, R. A.
Bainbridge, J. G.
Baker, C. W.
Baldwin, C. L.
Balz, G. A.
Barlow, J. F.
Bassett, G. L.
Bates, Charles J., Jr.
Batten, L. W., Jr.
Bavier, R. N.
Bayles, L. C.
Baylis, R. N.
Beal, T. R.
Bedell, K. H.
Belding, L. A.
Bell, S. J.
Bender, H. P.
Benedict, Harding
Benjamin, Marcus
Bennett, C. W.
Bensel, J. A.
Bergen, Frank
Berger, J. G.
Berghorn, C. W., Jr.
Bertram, James
Beyer, Richard
Bickerstaff, R. M., Jr.
Bingham, L. H.
Birkenstock, J. M.
Blakslee, R. C.
Blum, J. K.
Blythe, W. E.
Boettger, Robert
Bogert, J. W.
Bolton, H. L.
Bonell, R. K.
Bonnett, Louis B.
Bornemann, C. H.
Boucher, William J.
Bradshaw, T. P.
Braine, Bancroft G.
Brashear, Dr. John A.
Bräutigam, J. H.
Breithaupt, Gustave
Brensinger, G. F.
Brinckerhoff, A. G.
Bristol, B. B.
Bristol, H. H.
Bristol, William H.
Brown, E. J. S.
Bruen, G. E.
Bull, J. E.
Burling, H. S.
Bushnell, D. S.
Butler, William Allen
Butterworth, S. F.
Buvinger, W. S.
Byron, Edward

Cady, C. I.
Calisch, J. C.
Calkins, G. M.
Campbell, R. C.
Carll, Benjamin W.
Carlton, Newcomb
Carroll, M. B.

Carter, J. L.
Cawley, H. C.
Chadwell, W. H.
Chandler, A. D.
Chapin, Warren W.
Charavay, Marius A.
Chastenay, Charles D.
Clark, F. M.
Clark, H. D.
Clark, Walton
Cobb, P. L.
Cobb, Willard H.
Coffin, C. A.
Coggins, C. L.
Cohen, F. W.
Coker, J. L., Jr.
Cole, C. E.
Coley, Clarence T.
Collins, John, Jr.
Condit, T. Mulford
Cook, W. H.
Coster, M.
Coudert, Frederick R.
Crane, F. L.
Crichfield, Grant
Crisfield, James P.
Crisson, George
Crosby, F. B.
Cross, H. B.
Crowell, H. W.
Cudlipp, Charles W.
Cunningham, C. F.
Cuntz, H. F.
Cuntz, J. H.

Dale, O. G.
Darbee, W.
Darby, John
Darke, F. S.
Davey, Warren
Day, W. A.
Dear, William Y.
Dearth, Henry G.
DeHart, J. S., Jr.
Deimel, R. F.
Delafield, Eugene L.
Dempwolf, C. J. M.
Denton, Waldo E.
Dessar, Louis P.
Dickinson, J. A.
Dickson, Charles H., Jr.
Dickson, William B.
Dilworth, F. T.
Dinkel, George
Dixon, J. Alfred
Dixon, R. M.
Dombrowsky, Walter F.
Donaldson, S. A.
Dougherty, Paul
Draudt, Otto E.
Doying, W. A. E.
Duckham, A. M.
Ducommun, Edward
Duncka, F. A.
Dunlop, Charles W.
Dwight, Edmund

Eastwood, James
Ebsen, W. A.
Eggert, Louis H.
Ehrhardt, L. J.
Eilenberg, T. R.
Ellinger, E.
Elliot, T. A.
English, E. F.
Erlenkötter, Walter
Ernst, A. F.
Evans, George A.
Evans, William T.
Everett, C. J.

Faber, C. O.
Fallerius, H. G.
Fallon, John J.
Farr, Alfred A.
Farr, Arthur V.
Fielder, George B.
Fieux, E. D.
Finkensieper, B. W.
Finley, John H.
Fisk, Wilbur C.
Flack, J. Day

Forbes, A., Jr.
Forbes, Robert T.
Forstall, A. E.
Foster, E. H.
Fraentzel, F. C.
Freeman, Joseph E.
Frelinghuysen, G. G.
Freygang, Gustav G.
Freygang, Walter H.
Frundt, A. W.
Furman, Franklin DeR.

Gaffney, A. T.
Gammack, John W., Rev.
Gantt, H. L.
Ganz, Albert F.
Gause, F. T.
Gaylord, H. B.
Genscher, F. C.
George, E. D., Jr.
Gibbs, George
Gibson, F. M.
Gilmore, G. F.
Gilson, H. W.
Gleeson, J. A.
Goldsmith, J. A.
Goss, W. F. M.
Graydon, S. D.
Gremmel, H. G.
Griswold, H. E.
Gubelman, F. J.
Guillaudeu, Emile
Gunkel, F. H., Jr.
Gunther, Charles O.
Gurney, H. F.

Hagar, A. P.
Hagstoz, A. T.
Haight, R. S.
Haight, Thomas G.
Hake, August R.
Hall, A. H.
Halliday, William R.
Hamilton, W. J.
Hammerschlag, E. M.
Hanmer, L. G.
Harrington, H. G.
Hart, B. Franklin, Jr.
Hart, Leon O.
Harvey, George
Harvey, D. C.
Hays, David
Hazeltine, L. A.
Hebble, A. S.
Hedden, C. E.
Hedden, V. J.
Hegeman, J. C.
Heininger, Henry
Hemphill, Alexander J.
Hendrick, W. M.
Henofer, John P.
Henry, J. S.
Henry, V. S.
Hermanns, F. E.
Hess, R. G.
Hewitt, George
Heyworth, E. O.
Hickok, H. A.
Hickstein, E. O.
Higley, H. R.
Hill, N. S., Jr.
Hillas, Robert McKean
Hinkle, E. E.
Hock, F. W.,
Hodge, Percy
Hoermann, W. O.
Hoffman, H.
Hoffmann, W. J.
Hollingsworth, S.
Horne, H. F.
Horton, E. Q.
Horton, Th. A.
Howe, R. B.
Howell, J. W.
Hubert, P. A.
Humphreys, A. C.
Humphreys, R. G.
Hunt, H. S.
Hupfel, A. G.
Hussey, C. W.
Hussey, W. E.
Hyatt, H. R.

Idell, F. E.
Idell, P. C.
Iliff, W. L.
Ingham, W. G.
Inglis, R. N.
Irwin, F. K.

Jackson, W. W.
Jacobus, D. S.
Jacobus, R. F.
Jalien, J. J.
Jappe, K. W.
Jenkins, M. C.
Jenkinson, R. C.
Jenvey, William R.
Johansen, A. V.
Johnson, D. C.
Johnson, H. W.
Jones, A. E.

Karr, A. D.
Kay, C. C. C.
Kelley, W. M.
Kennedey, Herbert
Kent, William
Ketchum, Sameul
Keuffel, C. W.
Kidde, Walter
Kieselbach, H. A.
Kingsbury, C. L. L.
Kinsey, A. S.
Kipper, F. C.
Kirkbride, F. B.
Kirkman, T. W.
Kirkup, J. P.
Klein, A. C.
Klumpp, John B.
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Koester, Herman
Krause, F. C.
Kreitler, J. A.
Kroeh, Charles F.
Kupfer, O., Jr.
Kursheedt, R. S.

Ladd, James B.
Landvoigt, T. E.
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Lange, W. C.
Langletz, C. L.
Lansdell, R. H.
Lantry, J. P.
Larkin, John
Lasker, Harold H. C.
Law, Frank E.
Lawrence, A. R.
Lawrence, W. F.
Leigh, F. T.
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Leisenring, F. S.
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Lieb, John W., Jr.
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Loewenherz, Herman,
Logan, H. E.
Loppin, Alexander J.
Lorsch, Edwin S.
Lott, S. H.
Loud, Henry S.
Ludlow, William O.
Lunger, J. B.
Luqueer, Robert O.
Lydecker, Frederick A.
Lydecker, Kenneth
Lydecker, L. K.

McBurney, E. L.
McCorkle, Walter L.
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Trewin, C. S.
Tripp, G. E.
Tucker, John, Jr.

Uehling, E. A.

Van Blarcom, W.
Vander Veer, J. H.
Van Derveer, T. W.
Van Ingen, W. D.
Van Saun, P. E.
Van Winkle, Franklin
Vennema, A. W.
Villard, O. G.
Voorhees, J. R.

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Wagner, D. G.
Wagoner, P. D.
Waldeck, L. E.
Walder, J.
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Wallace, J. B.
Wandel, Carlton
Warner, S. T.
Waterbury, J. I.
Weber, G. J. F.
Webster, H.
Weigele, T. W.
Weissenborn, O. A.
Wellman, R. L.
Wells, T. B.
Wendell, G. V.
West, W. C.
Weston, A. J.
Weston, Edward
Weston, Edward F.
Weston, Walter
Wetmore, E. V.
Whitcomb, H. D.
White, H. E.
White, J. W. H.
Whiting, R. A.
Whitley, H. S.
Whitney, A. R., Jr.
Whitney, O. C.
Wiles, E. L.
Wiley, Louis
Wiley, T. A.
Wiley, W. H.
Williams, R. D.
Williams, R. H.

Willis, C. M.
Willis, C. A.
Wilson, George T.
Wittpenn, H. O.
Woodward, A. C.
Woolson, C. G.
Wreaks, H. T.
Wright, A. F.
Wright, Arthur
Wright, D. A.
Wright, W. P.

Yates, J. T.
Young, F. W.
Young, George W.

Zeiger, N. A.
Ziegler, C. T.
Zimmermann, H. D.
Zusi, N. E.

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J. W. Lieb, Jr.
F. A. Muschenheim
A. J. Post
H. A. Pratt
H. Torrance, Jr.
Class of '93

AN EXPLANATION

To the Editor, Stevens Indicator:

I am in receipt of a letter from a prominent alumnus calling my attention to the fact that the article in the last issue of the Indicator, entitled "Study of the Relative Merits of the Various Types of Electric Arc and Incandescent Lamps for Lighting Urban and Suburban Streets," contains cost figures which differ widely from actual costs found in practice. This is certainly a fact, and I am writing this letter for the purpose of pointing out that the cost figures for electrical energy given in the article referred to were not intended to be actual cost figures.

The assumed figure of one cent per kw-hr. for electrical energy at the lamp terminals was taken from the *University of Illinois Bulletin No. 51,* and this is there used as a convenient basic energy charge for the various types of lamps. The actual cost of electrical energy for any type of lamp is then obtained by multiplying this basic charge by the number of cents that energy costs per kw-hr., which varies within wide limits in different localities. In the bulletin referred to actual costs for energy are in fact based on one, two, three, four and five cents per kw-hr. at the lamp terminals. It is unfortunate that this was not pointed out in the article, and as this article was passed by me I feel that it is incumbent upon me to make this explanation.

I also find that the $60 given as the price of the magnetite lamp is an error in copying, and that this should read $40.

Yours very truly,

Albert F. Ganz.

OBITUARY

STEPHEN SQUIRES PALMER

Stephen Squires Palmer, a Trustee of Stevens, and a benefactor of the college, died at Redlands, Cal., on January 29, 1913.

Mr. Palmer was born in New York City, December 7, 1853, son of David and Mary Catherine (Squires) Palmer; grandson of David and Sarah (Shay) Palmer, and great-grandson of John Palmer, a French Huguenot who came to America about 1700 and settled in Westchester County, N. Y. His father was for many years cashier of The National City Bank, and was its vice president at the time of his death in 1894. He prepared for college at Nazareth Hall, Nazareth, Pa., but on the day of his final examinations he was called home by the death of his only brother, thus giving up a college education.

Entering the employ of Moses Taylor & Co., he was identified with these interests until his death, being a trustee of the Moses Taylor estate when he died. He was also identified with the following corporations as president, director or other officer: The New Jersey Zinc Company, The New Jersey Zinc Company (of Pennsylvania), Mineral Point Zinc Company, The Empire Zinc Company (of Colorado), Empire Zinc Company (of Missouri), The Bertha Mineral Company, The Palmer Land Company, Palmer Water Company, Prime Western Spelter Company, Harvey Steel Company, Delaware, Lackawanna & Western R. R. Co., Cayuga & Susquehanna R. R. Co., Green Bay & Western Railway Co., St. Louis & Hannibal R. R. Co., Kewaunee, Green Bay & Western R. R. Co., Iola &

Northern Railway Co., Detroit, Hillsdale & Southwestern R. R. Co., Fort Wayne & Jackson R. R. Co., Ahnapee & Western R. R. Co., Valley Railroad Company, Lackawanna Steel Company, Birmingham Coal & Iron Co., Woodward Iron Company, The National City Bank of New York, The Farmers' Loan & Trust Co., Franklin Trust Company, Princeton Bank, Princeton, N. J., Franklin Safe Deposit Company, Colonial Assurance Company, Consolidated Gas Company of New York, United Electric Light & Power Co., New York Mutual Gas Light Company, New York Edison Company, and United States Realty & Improvement Co.

Mr. Palmer was trustee of Princeton University as well as of Stevens Institute of Technology. He was the donor of the Palmer Physical Laboratory at Princeton which he built and equipped and turned over to the University in 1911. Among his other benefactions were St. John's Church at Palmerton, Pa., the Angel Choir and the All Angels Parish House of All Angels Church in New York City. He was a member of the Metropolitan Museum of Art, the American Museum of Natural History, the American Geographical Society, the New York Botanical Gardens, New York Geological Society, and many clubs.

Mr. Palmer was married September 24, 1879, to Susan Flanders Price, daughter of William Oliver Price, of Elizabeth, N. J., and had one child, Edgar Palmer, who survives him.

JOHN FRITZ

John Fritz, upon whom Stevens Institute of Technology conferred the honorary degree of Doctor of Science in 1907, died at his home in Bethlehem, Pa., on February 13, 1913, in the ninety-first year of his age. In the span of his life occurred nearly every great advance in the iron and steel industry, and much of this was due to his efforts.

He was born on August 21, 1822, in Londonderry Township, Chester County, Pa., and was the eldest of a family of seven children. His father was a millwright by trade, and lived on a small farm on which John worked until he was sixteen years of age. His early education was obtained under great difficulties.

When he became sixteen he started to learn his trade as blacksmith and machinist, and in 1844 did his first important work, assisting in the erection of the Morristown Iron Works, at Morristown, Pa. Soon after its completion he was placed in charge of the works.

In 1854 Mr. Fritz went to Johnstown, Pa., as general superintendent of the Cambria Iron Works. Here, after meeting strenuous opposition, he built a rail mill, with three-high rolls, direct-driven without gearing. Its success was all he had prophesied, and with this and other improvements the plant became the greatest of the time.

Mr. Fritz became general superintendent and chief engineer of the Bethlehem Iron Company, at Bethlehem, Pa., in 1860. He designed and erected the company's plant and carried out many important developments until his retirement.

He received many signal honors, being president of the American Institute of Mining Engineers, in 1894, and of

The American Society of Mechanical Engineers in 1896. He was an honorary member of this latter society, of the American Society of Civil Engineers, and of the Iron and Steel Institute of Great Britain, having received the Bessemer Gold Medal. Besides Stevens, Columbia University, the University of Pennsylvania and Temple University conferred honorary degrees upon him. He was one of the original trustees of Lehigh University when it was founded in 1868, and established the John Fritz engineering laboratory.

Mr. Fritz is survived by two sisters, a niece and three nephews.

OSCAR ANTZ

Oscar Antz, Stevens '78, died in Newark, N. J., on January 9, 1913. His home was in Dunkirk, N. Y. On October 20, 1912, he went to Newark to visit his mother and a few days later was stricken with Brights disease and heart trouble, which caused his death.

Mr. Antz had a full and successful career. Born September 16, 1859, the son of Emma and the late Theobald Antz, he received his early education in the public and private schools of Newark. After passing examinations for the high school, he decided on a technical education and entered the Stevens Institute of Technology, being one of the youngest men to enter the Institute. He was graduated in 1878 and at once became connected with the Pennsylvania Railroad, holding various positions up to assistant master mechanic. On December 1, 1900, he resigned this latter position to become master mechanic of the Central Railroad of Georgia, with headquarters at Savannah, but in April, 1903, became associated with the New York Central Lines, holding several positions, being at the time of his death general inspector of all new equipment for the entire system. Mr. Antz was also a contributor to the *American Journal*, the *Railroad Car Journal* and other papers.

On December 26, 1900, he married Miss Jennie L. Menagh at Newark, N. J. She survives him with two children, Joseph Lyndon and Mary Natalie. Mr. Antz also leaves his mother and one sister, Miss Natalie Antz, of the faculty of the Barringer High School, of Newark.

Stevens Indicator

PUBLISHED QUARTERLY BY

THE ALUMNI AND UNDERGRADUATES

OF THE

STEVENS INSTITUTE OF TECHNOLOGY

HOBOKEN, N. J.

EDITORIAL COMMENT

Stevens Alumni Luncheons

At the suggestion of H. deB. Parsons, '84, a new Stevens activity is to be established. On certain days, which will be designated well in advance, luncheon will be served in a private room at some accessible club or restaurant in New York to all Stevens men who attend. The luncheon is to be entirely devoid of formality and speechmaking, and is planned to bring together Stevens men who otherwise might not meet. The officials in charge want the alumni to feel that they have the privilege of "dropping in" without the necessity of binding themselves far in advance. The luncheons will occupy no longer time than the usual noon hour, and may be attended without interfering with business activities.

In the case of the first luncheon, held at the Whitehall club on Saturday, May 3, a slight departure from the general plan was necessary because the committee in charge had no

means of forecasting the attendance. In the future, however, no notice of intention to attend will be requisite.

The plan has been tried with much success by Stevens clubs in various sections of the country, and should serve to bring together, at least once a month, the Stevens men living in the vicinity of New York, and thus lead to many enjoyable acquaintances and a further welding together of the alumni.

Co-operation in the College

The annual alumni dinner, the proceedings of which are given in full elsewhere in this issue of the INDICATOR, was notable for many things, but for nothing more than the spirit of co-operation between the college administration, the alumni and the undergraduates which was exhibited. Dr. Humphreys is fond of saying that no college president in the country is more heartily supported by his alumni, and there seems to be no reason why the undergraduates, too, should not be included in this statement.

Differences of opinion will always exist between the governing body and those governed, but in the case of the students at Stevens this condition has been minimized through a system of self-government by which the students in large measure control their own affairs. This does not mean that they are contented because they make their own regulations, but rather because they have an adequate opportunity to express their own side of the question and are provided with means for obtaining the faculty's viewpoint.

How seriously these rights are cherished by the undergraduates is shown by their recent action in requesting and obtaining from the faculty permission to form a "Student Council" to control undergraduate affairs. When the Student Self-Government Board, an amplification of the Honor System Committee, was organized in 1909, it was the general understanding of the student body and faculty that the

Board would have the powers of the committee which it superseded and substantially those of the present Council. For a year or two affairs were administered with that idea in view. More recently the Self-Government Board has concerned itself largely with the proper conduct of the Honor System as applied to all class-room, laboratory and examination work in the college, and the students have therefore put into effect the new Student Council, composed of the heads of the undergraduate activities, to take care of that part of the work which does not concern the Honor System. The alumni may well be glad that such a condition of mutual trust and responsibility exists in the college.

Getting News of Stevens Men

The request published in the January INDICATOR that Stevens men transmit to the Editor or to the head of the Alumni Publicity Committee news of interest to those who have the good of the college and its graduates at heart has met with a ready response. An interesting fact is that the class representatives, who are supposed to be most closely in touch with the affairs of their respective classes, have not shown as much diligence as many alumni who are not class officials. There is a definite responsibility devolving on the representatives, and it is hoped that the response from them will be more general.

In this connection it may be well to point out a matter that has caused no little confusion. When an alumnus changes his address he is earnestly requested to send word of the fact to the INDICATOR, to the Secretary of the Alumni Association, or to the Registrar of the college. If the information is transmitted to any one of these three it will get to all by a system of exchange in force. To send such information to the President or to some other official can only result in extra trouble to the person addressed and the possibility of delay in entering the change upon the records.

ALUMNI DIRECTORY

ALUMNI ASSOCIATION OFFICIALS

President....ERNEST H. PEABODY, '90
First Vice-President....J. H. CUNTZ, '87
Second Vice-President....J. ALFRED DIXON, '91
Secretary....THOMAS C. STEPHENS, '00
Treasurer....LOUIS A. MARTIN, JR., '00

Directors: Term Expires 1913—R. H. RICE, '85; W. D. HOXIE, '89; F. A. MUSCHENHEIM, '91; W. E. S. STRONG, '92. Term Expires 1914—F. J. GUBELMAN, '89; H. E. GRISWOLD, '93; R. C. POST, '89; R. W. PRYOR, JR., '02.

Trustees: HOSEA WEBSTER, '82; E. H. PEABODY, '90; J. ALFRED DIXON, '91; WALTER KIDDE, '97; R. W. PRYOR, JR., '02.

Alumni Trustees: HOSEA WEBSTER, '82; WALTER KIDDE, '97; JOHN W. LIEB, JR., '80.

Stevens Institute Alumni Association (European Branch)—LAFAYETTE D. CARROLL, '84, *Acting Secretary.*

Stevens Club of Newark—W. R. HALLIDAY, '02, *Secretary.*

Stevens Club of Brooklyn—WILLIAM E. PAULSON, '04, *Secretary.*

Southern Alumni Club—A. M. MORRIS, '07, *Secretary.*

Stevens Club of Philadelphia—J. B. KLUMPP, '94, *Secretary-Treasurer.*

Stevens Club of Schenectady—RICHARD H. MARVIN, '03, *Secretary-Treasurer.*

Wisconsin Stevens Club—CORNELIUS T. MYERS, '00, *Secretary.*

Western Stevens Club—A. K. HAMILTON, '95, *Secretary.*

Stevens Club of Pittsburgh—E. A. CONDIT, JR., '02, *Secretary-Treasurer.*

New England Stevens Club—F. M. GIBSON, '01, *President.*

CLASS REPRESENTATIVES

'73.—J. A. HENDERSON, 120 North 19th St., Philadelphia, Pa.

'74.—H. W. POST, Box 415, Mountain Lakes, Boonton, N. J.

'75.—S. D. GRAYDON, Stevens Institute of Technology, Hoboken, N. J.

'76.—A. RIESENBERGER, Stevens Institute of Technology, Hoboken, N. J.

ALUMNI DIRECTORY

'77.—F. E. Idell, 50 Church St., New York City.
'78.—A. A. De Bonneville, 132 Nassau St., New York City.
'79.—John S. Cooke, 364 Broadway, Paterson, N. J.
'80.—J. W. Lieb, Jr., 55 Duane St., New York City.
'81.—R. M. Dixon, 2 Rector St., New York City.
'82.—Hosea Webster, 85 Liberty St., New York City.
'83.—F. C. Fraentzel, 804 Broad St., Newark, N. J.
'84.—W. L. Lyall, 439 Aycrigg Ave., Passaic, N. J.
'85.—A. W. Burchard, 30 Church St., New York City.
'86.—F. A. LaPointe, 63 Eighth St., Hoboken, N. J.
'87.—J. D. Flack, "Orienta," 302 West 79th St., New York City.
'88.—Richard Beyer, 902 Hudson St., Hoboken, N. J.
'89.—F. J. Gubelman, 47 West 34th St., New York City.
'90.—E. H. Peabody, 85 Liberty St., New York City.
'91.—C. G. Atwater, 17 Battery Place, New York City.
'92.—W. O. Ludlow, 12 West 31st St., New York City.
'93.—E. D. Lewis, 185 Madison Ave., New York City.
'94.—G. B. Fielder, Cartaret Trust Co., Sip Ave., Jersey City, N. J.
'95.—A. F. Ganz, Stevens Institute of Technology, Hoboken, N. J.
'96.—W. H. MacGregor, 165 Broadway, New York City.
'97.—J. M. Towne, 54 Walnut St., East Orange, N. J.
'98.—Robert Boettger, United Piece Dye Works, Lodi, Bergen Co., N. J.
'99.—J. S. Henry, Safety Car Htg. & Ltg. Co., 2 Rector St., New York City.
'00.—H. L. Underhill, Consolidated Gas Co., 501 East 21st St., New York City.
'01.—A. Siegele, Jr., 167 Lenox Road, Flatbush, Brooklyn, N. Y.
'02.—L. K. Lydecker, 2 Rector St., New York City.
'03.—S. H. Lott, Stevens Institute of Technology, Hoboken, N. J.
'04.—C. E. Hedden, Stevens Institute of Technology, Hoboken, N. J.
'05.—I. R. Lewis, care of Walter Kidde, 140 Cedar St., New York City.
'06.—L. A. Hazeltine, Stevens Institute of Technology, Hoboken, N. J.
'07.—Peter Minck, Kilbourne & Jacobs Mfg. Co., 25 Broad St., New York City.
'08.—G. D. Thayer, 24 Monticello Ave., Jersey City, N. J.
'09.—G. E. Terwilliger, 1 Liberty St., New York City.
'10.—Nelson Ogden, New London Ship & Engine Co., Groton, Conn.
'11.—S. J. Bell, Babcock & Wilcox Co., Bayonne, N. J.
'12.—Russell G. Hess, 709 Billings Ave., Paulsboro, N. J.

NEWS OF STEVENS MEN

'75

In the November and December issues of the *Journal of the Franklin Institute*, appeared a paper by I. N. Knapp on "Natural Gas, with Incidental Reference to other Bitumens." The paper is the result of wide experience and much research. It was delivered at a meeting of the Section of Mining and Metallurgy.

'76

Prof. A. Riesenberger sailed on March 29 on the *Molkte* for a sixteen-day cruise, touching at Havana, Porto Rico, Colon, Panama and Bermuda.

'80.

J. W. Lieb, Jr., a vice-president and general manager of the New York Edison Company, went to Dayton at the time of the recent flood, to take charge of the work of restoring light and power. He was assisted by the heads of electrical plants from all parts of the country who had volunteered to help in getting the wheels to moving again.

John A. Bensel, State Engineer of New York, gave an address in Washington, D. C., before the Washington Association of Engineers on February 4, on New York's $101,000,000 barge canal. The address was illustrated by moving pictures taken along the route of the canal. According to press reports Mr. Bensel said in part:

"It is interesting to note that while the total quantities of construction items on the barge canal are equal to about three-fourths of those on the Panama Canal, the barge canal, including terminals, is being built for little more than a third of the cost of the Panama Canal, and furthermore, that 9,000,000 citizens are paying for New York's canal while the cost of the Government canal is distributed among 90,000,000.

"For the fame of the barge canal it is unfortunate perhaps that the two canals are being built at the same time, for we of the barge canal think our project is entitled to rival or possibly outrank the Panama Canal in many respects from an engineering standpoint. There are six pairs of locks along the Panama Canal, as against 350 to 400 structures on the barge canal; the Panama Canal is fifty miles along, the barge canal 540 miles."

NEWS OF STEVENS MEN

'87

On January 25, 1913, J. H. Cuntz delivered a lecture before the Woman's Press Club of New York on "The Engineer and the World's Work."

Mrs. Isaac Ingalls Stevens announces the marriage of her daughter, Kate Stevens Bingham to James H. S. Bates on February 14, 1913, at Crestlawn, Dorchester, Mass.

'88

Announcement was recently made of the engagement of Miss Mary Reddy, daughter of Mrs. James M. Reddy, of 3913 Grand Boulevard, Chicago, to Paul Doty, who is general manager of the St. Paul (Minn.) Gas Light Company. Miss Reddy is a daughter of the late James Reddy, of Chicago, and a niece of Edward Cudahy, of Chicago.

'89

Among the alumni unavoidably prevented from attending the annual banquet was W. D. Hoxie, who sailed for Europe on the *Mauretania* on February 12. Mr. Hoxie showed that his heart was with the diners by despatching the following wireless telegram:

"Heartiest congratulations Dr. Humphreys' tenth anniversary; best wishes to alumni and guests. Will drink to-night to prosperity Stevens."

Before the message was transmitted, Mr. Hoxie learned that J. A. Norcross, '91, was also a passenger on the *Mauretania*, and the despatch as finally received was signed "Norcross–Hoxie." Unfortunately there was some delay in transmission, and the message did not arrive at the Astor in time for the dinner, but reached President Humphreys the following day.

'90

On March 28 Ernest H. Peabody gave a lecture illustrated with lantern slides before the student body of the Massachusetts Institute of Technology affiliated with the American Society of Mechanical Engineers. Mr. Peabody's subject was "Oil Burning," and comprised an outline of the styles and character of oil burners, and oil furnaces including mechanical atomization, and showed the results of some recent remarkable tests made by the Navy Department on Babcock & Wilcox marine boilers equipped with Peabody mechanical atomizers at the Philadelphia Navy Yard. These tests set a new record for high forcing and corresponding efficiency.

'91

Through W. S. Ackerman, the Indicator is in receipt of a menu of the "First Annual Dinner of the Alumni of Stevens Institute of Technology." The affair was held at the Hotel Manhattan, New York, on April 30, 1901,

and the menu is a simple four-page affair in striking contrast to the elaborate souvenirs that have been a feature of more recent dinners. The speakers included President Henry Morton, A. W. Stohe, '76, S. Bayard Dod, William Kent, '76, Henry R. Towne, B. Franklin Hart, Jr., '87, and Alten S. Miller, '88.

C. G. Atwater has received a letter from his classmate, George L. Manning, who is now a Professor in Robert College, Constantinople, relating some of his thrilling experiences in Turkey. The letter in part is as follows:

"December 20th, 1912.

"Dear Atwater:—

* * * * *

"Fortunately things are quiet again and we no longer fear the night as we did. Two weeks ago today we heard cannonading all day and in the evening our Vice-Consul came to me and explained the provisions taken for safety in case the troops were driven in from Chatalja. This was what we had to fear, for starving and desperate Moslem soldiers were expected to commit all sorts of violent acts before yielding their great imperial city to Christian victors. Uncle Sam, being as usual in such cases, slow to act, had left us to the care of England, for she had a fine cruiser promptly in our harbor. Three shots from one of the foreign naval vessels was to be the signal that trouble had broken out somewhere within the city limits and we should then expect to find a launch near our property to convey any of our number who wished to go on board a war vessel. None of us men thought for a moment of leaving the college, but the mothers and their children were expected to go on board. As you can imagine our ears were keen. Fortunately no signal came and our Turkish government really managed the city's order exceedingly well. I went several times to town, business men went every day, and Mrs. Manning went alone one day at this time. Our bags were packed, however, for immediate departure to the college enclosure, and our valuables were safe in the college vaults. Every time I shaved it meant getting the tools out of the bag, and the bags as well as the revolver were on chairs by our bedside at night. For ten days or more we had at the college nine marines from the *Scorpion*, our United States stationaire, but they were not needed. We do feel, however, that if Holland and Roumania could send vessels to guard their subjects here, few in numbers as they are, it would have been well for the United States to be represented too and by a real fighting machine. In the Orient those powers who can show their power are respected. The founding of Robert College is a conspicuous example of the truth of this statement.

"We are quiet at present. What the future will bring no man knows. There are still very serious possibilities and that even without the most awful possibility; a general European war. But every day of peace we regard as so much gained; and when the cost of war is fairly faced it seems impossible for it to continue.

"We have, I believe, just reason to feel thankful and proud of our boys; that they have stuck to their tasks every day throughout the war. Some of their fellows and one of their teachers were called away to fight, and we have had representatives from all sides among our students; yet peace has reigned among us—among our four hundred and fifty students many of whom had all their grown male relations in the armies."

'92

The firm of Ludlow & Peabody, of which William O. Ludlow is a member, has recently been appointed architects for the most important group of college buildings in the South, the George Peabody College for Teachers at Nashville, Tenn. The layout will comprise a group of fifty-seven buildings occupying a tract of sixty acres of ground overlooking the city of Nashville and designed for the education of the teachers for the normal schools of the South.

William C. Cuntz returned on February 27 from a business trip abroad, during which he visited Essen, Berlin, Paris and London.

Nicholas S. Hill, Jr., was recently retained by the New Jersey State Water Supply Commission as one of a committee of three experts to evaluate the property of the East Jersey and Elizabethtown Water Companies, in anticipation of the possible taking over of these properties by the State. Mr. Hill was also recently appointed by Bayonne as one of two experts to appraise the value of the water supply company's plant in that city.

The Gurney Elevator Company, of which Howard F. Gurney is president, has completed the installation of 150 Gurney elevators in the Bush Terminal Company docks and a large number in the New York dock terminals.

Andrew J. Post, president of Post & McCord, Inc., is treasurer and a director of the Architects Offices Incorporated, in whose new building his firm will be situated after May 1.

Henry C. Meyer, Jr., was consulting engineer for the electrical work on the new Guaranty Trust Company's building at Liberty Street and Broadway, New York, which was recently opened, and will act as consulting engineer for the heating and ventilating system of the new office building for J. P. Morgan & Company in New York.

W. E. S. Strong has been retained to represent J. P. Morgan & Company directly as their consulting engineer in the construction of their new office building. Post & McCord, of which A. J. Post, '92, is president, and R. C. Post, '98, is secretary, will have charge of the steel construction work, and Henry C. Meyer, Jr., '92, will act as consulting engineer for the heating and ventilating.

'93

"Valves, Valve-Gears and Valve Diagrams," by Prof. F. De R. Furman, has been adopted as the standard text-book on this subject by the University of Minnesota.

'95

Prof. Albert F. Ganz has recently been appointed a member of a committee on Street Lighting of the National Electric Light Association. The chairman of this committee is John W. Lieb, Jr., Stevens, '80, and the other members are Dr. Charles P. Steinmetz, Dr. Louis Bell and Preston S. Millar. Prof. Ganz was elected a member of the Hoboken Board of Trade at the regular March meeting of the Board.

F. K. Vreeland has changed his address to 31 Nassau Street, New York City.

G. E. Bruen is superintendent of the Electrical Department of the Suburban Fire Insurance Exchange, 123 William Street, New York City.

'96

Edgar E. Burnet is assistant superintendent of the Judson Manufacturing Company, Oakland, Cal.

Frederick R. Harris, who is a civil engineer of the United States Navy, with headquarters at the Brooklyn Navy Yard, recently left on a trip to Honolulu to inspect drydock facilities there.

Willard H. MacGregor, formerly with the Westinghouse Electric and Manufacturing Company, at 165 Broadway, New York, has taken a position with the Aladdin Company, at 90 Broadway.

'97

Joseph M. Towne and Miss Jessie Louise Dodd were married at East Orange, N. J., on February 1.

Robert L. Messimer is assistant to general manager, Studebaker Corporation, Detroit, Mich.

'98

T. F. Dreyfus is with the Brookhaven Lumber & Manufacturing Co., Hattiesburg, Miss.

NEWS OF STEVENS MEN

H. R. Davis has left the employ of the Kansas Natural Gas Company, at Independence, Kansas, to take a position with the Hope Engineering and Supply Company of Pittsburgh, Pa.

'99

A. G. Sidman is Resident in charge of the construction of a large Power House and Transmission lines which the Lehigh Coal and Navigation Company are building in Pennsylvania. Current will be transmitted at a voltage of 110,000.

'00

A son was born to Mr. and Mrs. Clarence N. Durrie, November 10, 1912. He has been named John Nicoll Durrie.

Two huge brick smoke stacks, each 150 feet in height, which had stood for forty years, were undermined and toppled over without a mishap recently at the plant of the Eclipse Tanning Company, 119 Sussex Avenue, Newark, N. J. The stacks were hemmed in by buildings, but none of them was damaged. The task was in charge of J. C. Percy, mechanical engineer of the company. Placing timber shoring around the base of the stacks, he cut partly through the masonry, near the bottom, and filled the cavities with wooden stays. These stays were thoroughly soaked with kerosene and then set afire. About twelve minutes later the supports had burned away under one stack and the great mass of masonry fell over. For half the distance to the ground the stack kept its form; then it crumbled and the impact with the ground reduced it to débris. Three minutes later the second stack followed its mate in precisely the same manner.

'01

C. B. Goode's address is now in care of Riegos y Fuerza del Ebro, Barcelona, Spain.

Arthur S. Lewis is the Eastern Representative of the Chicago-Cleveland Car Roofing Company, 50 Church Street, New York City. His home address is 1070 Park Place, Brooklyn, N. Y.

'02

William H. Taylor is now manager of the Omaha Gas Company, 1509 Howard Street, Omaha, Neb.

A. D. Smith has changed his address to 1329 Valley Place, Anacostia, D. C.

'03

R. H. Marvin is the author of an article appearing in the *General Electric Review* for March, dealing with the arcing ground suppressor and its

uses. The article indicates the field of the suppressor, shows the difference between its construction for different systems, and explains the cycle. It also discusses the advantages and limitations of the apparatus.

Robert E. Burke is with the Standard Oil Company of New York in its Construction Department at Shanghi, China.

'04

Charles M. Willis is assistant gas engineer with the J. G. White Management Corporation, 43 Exchange Place, New York City. His home address is 49 Oakview Avenue, Maplewood, N. J. Mr. Willis was married on June 11, 1912, to Miss Dorothy MacLeod Patterson, of Trenton, N. J.

Harlan A. Pratt is now manager of the industrial and power division of the Westinghouse Electric & Mfg. Co., with offices at 165 Broadway, New York.

'05

George A. Balz has changed his address to P. O. Box 327, Perth Amboy, N. J.

'06

H. H. Davis is with the Crucible Steel Company of America, Pittsburgh, Pa., in their sales department.

J. H. Deppeler is with the Goldschmidt Thermit Company, at their factory office, 92 Bishop Street, Jersey City, N. J.

'08

A. S. Harlow is assistant manager of the Bosch Magneto Company. His address is 1470 North Street, Springfield, Mass. Mr. Harlow's engagement to Miss Jeannette W. Sadlier of Walden, N. Y., daughter of Mr. and Mrs. Charles Sadlier has recently been announced.

Charles C. Phelps has resigned his position with the Edison Storage Battery Company at Orange, N. J.

Rudolf Pollak's present address is care of Buxton, Cassini & Cia, Calle Luipacha 602, Buenos Aires, Argentina, South America.

The marriage is announced of Marie Robinson Woolston, daughter of Mr. and Mrs. Lemuel B. Woolston, to Edgar Dawson George, Jr., on Saturday, March 15, 1913, at Plainfield, N. J. Mr. and Mrs. George will be at home to their friends after May 1 at 214 High Street, Perth Amboy, N. J.

J. L. Moss, Jr. is in the Engineering Department of the Simplex Automobile Company, New Brunswick, N. J.

C. W. A. Steinmetz is in the Heating and Ventilating Department F. M. Andrews & Co., 1 Madison Avenue, New York. His home address is 48 Hauxhurst Avenue, Weehawken, N. J.

'09

As the Indicator goes to press news is received of the death of Franklin Butler Crosby in an automobile accident on April 20.

Thorn Birdseye's present address is 19 Southard Street, Trenton, N. J.

Robert S. Pickett has accepted a position with the Griscom Russell Company, 90 West Street, New York City, in their sales department.

William G. Mixer, permanent president of the Class of 1909, was one of several Stevens men connected with the 1913 Automobile Show in New York. He was stationed at the Grand Central Palace, having been sent from the Western factory to act as chief mechanical expert at the exhibit of the Case motor cars.

Wallace M. Hendrick's home address is now 11 Clarkson Avenue, Brooklyn, N. Y. He is now connected with the New York Continental Jewell Filtration Company, makers of gravity and pressure filters.

Ward Harrison, representing the Illuminating Engineering Society, presented a paper on "Industrial Lighting" at the meeting of the American Society of Mechanical Engineers in New York on March 13, 1913.

The home address of G. E. Terwilliger is now 850 Clinton Avenue, Newark, N. J.

'10

B. V. Pfeiffer is with the Nashville Gas & Heating Company, Nashville, Tennessee.

Arthur P. Roscoe has been appointed to the position of Junior Engineer with the Public Service Commission for the First District, New York. He is located with the 6th Division, Part II at 565 Fifth Avenue, Brooklyn, the work at present consisting of the Fourth Avenue Subway extension from 40th Street to 90th Street.

'11

On Saturday, January 4, Raymond P. White was married to Miss Hazel G. Gilmore of Waterbury, Conn. Mr. White is now with the Hills Brothers Company of New York. His business address is Beach and Washington Streets, New York City.

A. H. Harris, Jr. has accepted a position with the Providence Gas Company, Market Square, Providence, R. I.

W. E. Blythe is with the Crocker-Wheeler Company of Ampere, N. J.

W. H. Koch has accepted a position with the A. and F. Brown Company Elizabethport, N. J.

Armin S. Hoffman has accepted a position with the Lowell Gas Light Company of Lowell, Mass.

C. W. MacMullen is with the International Motor Company, in their Mack Works at Allentown, Pa.

Charles G. Macdonald is in the Taylor Stoker Department of the American Engineering Company at Philadelphia, Pa. His mail address is Delta Tau Delta House, Castle Point, Hoboken, N. J.

'12

H. W. Stortz is now in the Service Department of the Edison Storage Battery Company at Orange, N. J.

Writing from Independence, Kansas, S. B. Crooks, says that he understands that all Stevens men in Kansas are affiliated with the Kansas Natural Gas Company, having headquarters at Independence.

'13

Lawrence L. Stevens, ex-'13, was married to Miss Anna Dingee Malpass of Philadelphia on April 2, 1913.

ALUMNI NEWS

MIDWINTER MEETING

The annual midwinter meeting of the Alumni Association, held at Castle Stevens on the evening of Wednesday, January 15, commanded a good attendance. The meeting was preceded by an informal dinner at 6.30 served in the lunchroom by the Castle management, after which the alumni present adjourned to the rotunda on the first floor, which had been filled with chairs for the purpose.

E. H. Peabody, '90, president of the Alumni Association, called the meeting to order, and introduced G. H. Caffrey, '06, who led the singing and cheering throughout the evening. President Peabody made a brief survey of the work of his administration, dwelling on the plans for wiping out the deficit of the Association's treasury.

T. C. Stephens, '00, secretary of the Alumni Association, read the names of the following alumni who have died since the last annual meeting:

Ralph P. Badeau, '09,
Died July 20, 1912.
Samuel Tenney Mudge, '06,
Died September 8, 1912.
Chester E. Bradley, '03,
Died October 29, 1912.
William J. Beers, '89,
Died October 17, 1911.
(Not previously announced.)
Frank A. Magee, '83,
Died January 2, 1913.
J. Hurst Fulton, '05,
Died August 19, 1912.

The proposed amendment to the constitution of the Alumni Association concerning the admission of past presidents of the association as members of the executive committee, reported in full in the minutes of the meeting of the executive committee of January 15, 1913, was read in accordance with the constitution.

Others who spoke were Dr. D. S. Jacobus, '84, reporting for the Denton

Memorial Committee; F. J. Gubelman, '89, who spoke of the work of the Publicity Committee; Henry Torrance, Jr., '90, who told of the Graduate Fund; H. A. Pratt, '04, who described the workings of the new Athletic Council, and John S. DeHart, '90 who gave advance information concerning the testimonial dinner to Dr. Humphreys.

After these reports had been received, President Humphreys took the floor and made an intimate talk to the alumni, speaking particularly of the increased coöperation between undergraduates, faculty and alumni which was apparent. Dr. Humphreys told how he had been a guest at the recent Senior Dinner, and how many things had been threshed out to the advantage of all concerned.

Among others who made brief addresses were Walter Kidde, '97, and John W. Lieb, Jr., '80, alumni trustees, both of whom spoke in the highest terms of Dr. Humphreys' service to the college.

At the conclusion of the formal exercises, the alumni present partook of the refreshments prepared by the committee in charge, and many embraced the opportunity of exploring the Castle, much to the astonishment of certain sleepy undergraduates who had retired for the night.

The following alumni signed the roll:

William Kent, '76
Lewis H. Nash, '77
A. S. Kursheedt, '80
John W. Lieb, Jr., '80
D. S. Jacobus, '84
Charles W. Thomas, '84
Edward B. Mowton, '86
Alfred H. Adilesinger, '87
James H. S. Bates, '87
J. H. Cuntz, '87
W. Everett Parsons, '87
George Dinkel, '88
Alten S. Miller, '88
James Eastwood, '89
W. F. Lawrence, '90
E. H. Peabody, '90
G. L. Todd, '90
Henry Torrence, Jr., '90
J. A. Dixon, '91
Andrew J. Post, '92
W. E. S. Strong, '92
O. C. Whitney, '92
F. DeR. Furman, '93
Albert F. Ganz, '95
Edward W. Robinson, '95
C. G. Woolson, '96
Walter Kidde, '97
H. C. Mathey, '97
F. L. Pryor, '97
Rudolf V. Rose, '97
G. Danforth Williamson, '97
H. T. Woolson, '97
W. E. Hussey, '98
Herman Robinson, '98
L. de L. Berg, '99
Percy C. Idell, '99
Robert O. Luqueer, '99
Louis A. Martin, Jr., '00
Louis A. Phillips, '00
Thomas C. Stephens, '00
Clarence T. Coley, '01
Howard V. Meeker, '01
August Siegele, Jr., '01
R. T. Anderson, '02
W. R. Halliday, '02
C. B. LePage, '02
Leigh K. Lydecker, '02
Paul J. Martin, '02

R. W. Pryor, Jr., '02
V. E. Royle, '02
S. H. Lott, '03
F. Rabbe, Jr., '03
Charles J. Roeser, '03
Frederick F. Schuetz, '03
Clarence Earle Hedden, '04
R. F. Jacobus, '04
Harlan A. Pratt, '04
M. A. Charavay, '05
Elias Q. Horton, '05
P. Leserman, Jr., '05
I. R. Lewis, '05
Kenneth Lydecker, '05
A. Obrig, '05
C. E. Cole, '06
George Crisson, '06
George A. Evans, '06
F. A. Gaylord, '06
Louis H. Goldstein, '06
L. A. Hazeltine, '06
P. J. Howe, '06
David C. Johnson, '06
Joseph P. Kirkup, '06
C. A. Niles, '06
A. L. Duhart, '07
J. P. Henofer, '07
John A. Meeker, '07
C. G. Michalis, '07
Peter Minck, '07
Walter Erlenkotter, '08
Arthur V. Farr, '08
Clinton Inglee, '08
Charles C. Phelps, '08
C. W. A. Steinmetz, '08
C. A. Sturken, '08
A. J. Carniaux, '09
A. S. Clark, '09
Franklin B. Crosby, '09
B. W. Finkensieper, '09
G. G. Freygang, '09
W. M. Hendrick, '09
H. A. Kieselbach, '09
C. E. Möbius, '09
John H. Peper, Jr., '09
R. W. Smith, '09
Gerald E. Terwilliger, '09
Julius G. Berger, '10
Fred H. Gunkel, '10
C. G. Henkel, '10
David N. Mauger, '10
J. Murphy, Jr., '10
Peter J. Nestler, '10
J. R. Voorhees, '10
Andrew C. Whyte, '10
T. A. Wiley, '10
J. F. Barlow, '11
Stewart J. Bell, '11
H. S. Burling, '11
A. R. Elmendorf, '11
E. O. Hickstein, '11
H. S. McIlvain, '11
C. G. Macdonald, '11
George L. Mitchill, '13
A. H. Nicholls, '11
E. S. Quackenbush, '11
Arthur F. Requa, '11
C. M. Stanley, '11
Arthur Wright, '11
F. W. Young, '11
L. A. Belding, '12
E. Byron, '12
C. Dempwolf, '12
Walter F. Dombrowsky, '12
L. H. Eggert, '12
Walter H. Freygang, '12
Alfred D. Karr, '12
Walter C. Lange, '12
C. L. Langlotz, '12
H. H. C. Lasker, '12
Raymond Loughlin, '12
A. W. MacNabb, '12
W. E. Marshall, '12
Q. J. Schwarz, '12
H. P. Smith, '12
H. W. Stortz, '12

STEVENS CLUB OF BROOKLYN

The Stevens Club of Brooklyn, one of the most active of the organizations allied with the Alumni Association, held a dinner at the University Club of Brooklyn on the evening of March 25. Twenty-nine guests were present. President Humphreys and E. H. Peabody, '90, president of the Alumni Association, were the guests of honor. The club enforced its custom of requiring every man present to make a short impromptu speech, and many interesting facts and suggestions were developed in the course of the evening.

ALUMNI NOMINATIONS

Following are the names to be presented to the Alumni Association as the ticket for annual election:

President,	J. H. Cuntz, '87.
Vice President,	J. A. Dixon, '91.
2d Vice President,	William E. S. Strong, '92.
Secretary,	G. G. Freygang, '09.
Treasurer,	L. A. Martin, Jr., '00.
Directors	(Four positions to be filled.)
	John S. DeHart, Jr., '90.
	F. A. Muschenheim, '91.
	C. H. McCullough, Jr., '91.
	F. W. Cohen, '92.
	Frank E. Law, '92.
	Thomas C. Stephens, '00.
	D. C. Johnson, '06.
Alumni Trustee	(One to be elected.)
	E. H. Peabody, '90.
	Richard H. Rice, '85.
	R. S. Kursheedt, '80.

MICHIGAN STEVENS CLUB FORMED

The Michigan Stevens Club was brought into existence at an organization banquet held at the Hotel Cadillac, Detroit, on Friday evening, March 28. The banquet was well attended and every one present thoroughly enjoyed the informal evenings entertainment and the pleasure of discussing old times.

During the course of the banquet, telegrams of congratulation were received from President Humphreys and the secretaries of all the other alumni clubs. Furthermore, several letters from professors at Stevens and one from Professor Pryor giving a detailed account of the growth and improvement made in recent years at the college added interest to this event, especially for the men who have not had the time or opportunity to visit the college for a long period.

There are at the present time fifteen graduates residing in the city of Detroit and six in other cities of Michigan.

The club's plans include quarterly meetings commencing with March 28 as the first meeting; an annual meeting to be held on the last Friday of March, and in addition to these, regular meetings of the "Monday Boosters." Arrangements have been made to have as many of the men as can conveniently do so, meet informally each Monday at luncheon at the Hotel Cadillac, Detroit.

At the banquet the following officers were elected for the ensuing year: President, E. T. Birdsall, '86; Vice President, W. B. Wreaks, '89; Treasurer, R. S. Lane, '08; Secretary, L. J. Schneider, '11. Publicity Committee, C. T. Myers and L. J. Schneider. The Executive Committee includes all officers.

CLASS OF 1893 DINNER

The Class of 1893 held a well-attended dinner at the Engineers' Club in New York on March 14. Plans were considered for the celebration of the twentieth anniversary of the class in appropriate style at Alumni Day in June, and other matters of class interest were discussed.

Among those present were Prof. Franklin DeR. Furman, H. H. Adams, B. G. Braine, H. F. Cuntz, William Y. Dear, J. A. Goldsmith, A. G. Hupfel, E. D. Lewis, R. Rieger, Clinton MacKenzie, Wessels Van Blarcom and Lewis C. Bayles.

DINNER OF SCHENECTADY CLUB

The annual dinner of the Stevens Club of Schenectady was held at the Mohawk Golf Club on March 14, 1913. The dinner was held at this time so that Professor Ganz and the Senior Class, who were in Schenectady on the inspection trip, could attend, and their presence added greatly to the enjoyment and enthusiasm of the evening.

The guests of the club were President Alexander C. Humphreys, Prof. Albert F. Ganz, L. A. Hazeltine, G. L. Mitchill, from the Institute; Dr.

Palmer C. Ricketts, President of Rensselaer Polytechnic Institute, and Langdon Gibson, production manager of the General Electric Works.

A most enjoyable evening was spent by all. An excellent menu was served. Between the courses all joined in singing the familiar Stevens songs. This was followed by some excellent speeches, President H. H. Mapelsden acting as toastmaster.

President Ricketts was the first speaker, and spoke in a humorous manner on the difficulties of a college president. Langdon Gibson then related some interesting reminiscences of his trip to the north coast of Greenland on one of the Peary expeditions.

Henry Torrance, past president of the Stevens Alumni Association, gave a humorous talk on the value of a college education.

Dr. Humphreys impressed upon his hearers that it was the duty of an educational institution not only to supply a knowledge of some particular science, but to instill a knowledge of economics and an interest in the affairs of the nation that would fit its students to become valuable citizens.

Professor Ganz dwelt upon the value of a course in the testing department of the General Electric Company as supplementary to the college course.

During the dinner, President Mapelsden presented Dr. Humphreys with a check for the annual contribution of the club to the Graduate Fund.

In addition to the guests and speakers previously mentioned, forty-five students from the Senior Class, and fourteen members of the club were present.

PITTSBURGH CLUB BANQUET

The annual banquet of the Pittsburgh Stevens Club, given in honor of Professor Ganz and the Senior Class on inspection trip, was held at the University Club, in Pittsburgh, Wednesday evening, March 19, 1913.

Fritz Uhlenhaut, Jr., president of the Association, was toastmaster, and following his address of welcome, short speeches were made by Professor Ganz, Messrs. Steward, Whigham and Vander Veer, president of the Senior Class.

The following officers for the local association were elected for the coming year:—President, Mr. Uhlenhaut; vice-president, Edwin D. Dreyfus; treasurer, D. G. Sinclair; secretary, H. E. Williams.

In addition to Professor Ganz and the class, the following alumni were present:

F. Uhlenhaut, '88, William Whigham, '88, J. E. Steward, '83, P. S. Whitman, '97, L. P. Streeter, '00, H. E. Williams, '00, D. G. Sinclair, '02, E. D. Dreyfus, '03, R. F. Carey, '06, H. H. Davis, '06, E. I. Weseman, '07, S. A. Hazen, '09, J. V. Perry, '12.

REPORT OF 1912 ALUMNI DAY COMMITTEE

Receipts

Old Guard	$147.00	
Class 1886	15.00	
Classes '84, '85, '87 to '02, and '04 to '11 ($25 each)	650.00	
Receipts of the baseball game	41.25	
Classes 1913, 1914 and 1915 $5 each)	15.00	
Class 1891, for blue silk flag	18.25	
Castle Stevens, dinners for 294 guests	441.00	
Castle Stevens, from Senior Class toward camp chairs	9.37	
Charles B. Grady	.19	
		$1,337.06

Contribution from the Old Guard included $22.50 for dinners so that the net amount received toward Alumni Day from the Old Guard was $124.50.

Class 1903 did not contribute anything toward Alumni Day.

Expenditures

Castle Stevens, on account of guests' dinners	$300.00
Postal cards	16.00
Printing postal cards	1.75
Typewriting	3.85
Postal card postage and clerical work	22.77
Guarantee to Lafayette College for baseball team	170.00
Printing	65.25
Castle Stevens, on account overpayments for dinners for Old Guard	1.50
Engrossing envelopes	5.00
Engraving invitations	18.64
Multigraphing	4.10
Arm bands, etc	18.10
Printing programs and tickets	53.00
Postage	1.50

Band concert, evening and afternoon	217.00	
Printing postal cards and supper tickets	5.00	
Lanterns	8.00	
Castle Stevens, dinners for Old Guard	21.00	
Flags	57.00	
Drinking water	11.00	
Electrical work	26.90	
Electrical current	3.20	
Camp chairs	25.00	
Installing electric lighting	140.00	
Castle Stevens, on account of guests' dinners, balance due	141.00	
Advanced by Charles B. Grady	.19	
Castle Stevens, dinners for band, etc	29.80	
Stevens Institute, material for decoration, ice and labor	96.28	
		$1,433.33
Deficit		$126.27

Respectfully submitted,

CHARLES B. GRADY,
Treasurer.

Audited by:

A. RIESENBERGER.
AUGUST SIEGELE, Jr.
FREDERICK A. MUSCHENHEIM.

EXECUTIVE COMMITTEE MEETINGS

A meeting of the Executive Committee of the Alumni Association of Stevens Institute of Technology was held at Castle Stevens, Hoboken, N. J., on Wednesday, January 15, 1913. The meeting was called to order at 5.45 p. m. by President E. H. Peabody. The other members present were:—J. H. Cuntz, F. J. Gubelman, J. A. Dixon, W. E. S. Strong, Walter Kidde, L. A. Martin, Jr., R. W. Pryor, Jr.,. and T. C. Stephens. The following past-presidents of the Association, Dr. Alexander C. Humphreys, William Kent, R. S. Kursheedt, Henry Torrance, Jr., and George Dinkel; G. E. Terwilliger, managing editor of the INDICATOR and H. A. Pratt, Chairman of the Athletic Council, also attended.

The minutes of the previous meeting of December 10, 1912, were read and approved as corrected.

Mr. Peabody reading Mr. Hart's report on "Stevens Night" announced that the net proceeds of the theatre party held at the New Amsterdam Theatre on December 6, 1912, were $921.80. A vote of thanks to Mr. Hart and the members of his committee had been passed unanimously at the previous meeting.

Speaking of the payment of bills by the various committees, Professor Martin suggested that all bills be sent to the Treasurer's office for payment, thereby avoiding unnecessary confusion and the rendition of erroneous reports.

Mr. Pratt reported that the Athletic Council was working out in good shape, that three regular dates for meetings had been decided upon and that there had been two regular meetings this year. Besides a special meeting to be held February 20th, these meetings are as follows:—The first Thursday in October, second Thursday in December, and second Thursday in April.

At the meetings the question of schedules and coaching are gone into as well as all general questions touching athletics. The committee believes that as much effort in money should be expended on the coaching system as can consistently be given, and steps are being taken along these lines. The finances of the Council are in very good shape.

Reporting for the Committee on Increase of Membership, Mr. Dixon, chairman, announced that up to date the committee had received the following applications, some of which had been previously presented to the Executive Committee for action:

For reinstatement to Active Membership	21
Associate Membership	2
Life Membership	2

The above accomplishments were largely the result of a general canvass, and the committee hoped that the individual work now under way would show increased and gratifying results.

Mr. Dixon then moved that the following former members be reinstated to membership subject to their making the necessary payments, upon notification of the amount by the proper officer of the Association, and that receipts for such payments be sent each one for the full period covered by the amount tendered:

George H. Chadwell, '03,
Paul Willis, '85,
F. M. Walker, '07,
Wallace Willitt, '96,
Joseph A. Schmidt, Jr., '98.

George B. Fielder, '94,
Robert C. Stanley, '99,
H. C. Mathey, '97,
Philip Leserman, Jr., '05.

Motion seconded by Mr. Stephens. Carried.

Mr. Dixon again moved that H. V. H. Neefus, '04, having never acknowledged his membership in the Association by payment of dues, and probably never having made personal application, simply being enrolled as a member through the election of his class as a whole, and having now applied for active membership, the Executive Committee present his name to the Association for election to active membership. Seconded by Professor Martin. Carried.

Mr. Dixon further moved that C. T. Church, '95, having made application for Life Membership in the Association, his application be accepted by this committee and that he be elected to life membership subject to the payment of the necessary amount. Seconded by Mr. Kidde. Carried.

Mr. Stephens moved that Henry A. Howe, '11, having complied with all the requirements of the constitution, be elected to life membership in this Association. Seconded by Mr. Gubelman. Carried.

Mr. Gubelman stated in his report for the Publicity Committee that a letter had recently been sent to all class secretaries or representatives urging them to send to the chairman of the committee or the managing editor of the INDICATOR or both, any matters of interest concerning the members of their class, giving any information concerning their connection with any prominent piece of work or with any notable event, or when any one of them accomplished anything noteworthy or did something of interest to their fellow alumni, so that his committee might give publicity thereto not only in the INDICATOR, but also in the newspapers, trade papers, magazines and journals. Mr. Gubelman stated that the committee would appreciate any news of this character.

In accordance with a motion passed at the Executive Committee Meeting of July 2, 1912, Mr. Stephens then presented for the consideration of the Executive Committee an amendment to the constitution to be presented at the following Midwinter Meeting.

Resolved, that Article V, Section 1, now reading:

(a) The officers, together with the eight Directors, shall constitute the Executive Committee. The Alumni Trustees shall be ex-officio members of the Executive Committee. (June 10, 1908.)

(b) At least three of the members of the Executive Committee shall be residents of the State of New Jersey. (June 10, 1908.)
be amended by adding a clause reading:

(c) The past-presidents of this association shall be invited to be present at all meetings of the Executive Committee, but as such shall not count toward a quorum or be allowed to vote, except that the five past-presidents who last held office shall have regular voting power.

Seconded by Professor Martin. Carried.

Mr. Peabody brought up the question of holding a Stevens dance, combined with the New York concert of the musical clubs. After discussion it was the sense of the committee as expressed in a motion made by Mr. Gubelman and seconded by Mr.Pryor that such a dance might be advantageously held at the concert next year.

Dr. Humphreys announced that he had perfected an arrangement by which the entire senior class would be present at the annual Stevens banquet.

There being no further business, the meeting adjourned at 6.45 p. m.

The Executive Committee of the Alumni Association of Stevens Institute of Technology met at the Engineers' Club, New York City on Tuesday, February 4, 1913. President E. H. Peabody called the meeting to order at 1.15 p. m. The other members present were:—J. H. Cuntz, F. J. Gubelman, J. A. Dixon, F. A. Muschenheim, W. E. S. Strong, Walter Kidde, R. C. Post, L. A. Martin, Jr., R. W. Pryor, Jr., and T. C. Stephens. Dr. Alex. C. Humphreys, R. S. Kursheedt, H. deB. Parsons and George Dinkel, past-presidents of the Association, and G. E. Terwilliger, managing editor of the INDICATOR, also attended.

A motion was made and seconded that inasmuch as all members of the committee had received copies of the minutes of the previous meeting of January 15, 1913, the reading of the same be dispensed with. Carried. Mr. Cuntz offered a correction as to the insertion of one other date for meetings of the Athletic Council. The minutes were then approved as corrected.

Mr. Dixon reporting for the Committee on Increase of Membership presented the following names for reinstatement:

M. C. Jenkins, '87,
J. C. Danziger, '89,
Alex. J. Hamilton, '95,
Franklin F. Overton, '96,
J. W. S. Moss, '09,

and moved that these gentlemen be reinstated to active membership

in the Alumni Association of Stevens Institute of Technology, and that they be sent by the Secretary proper notice of their reinstatement and acknowledgement of their remittance, also back numbers of the INDICATOR for the current year and all privileges as provided by the constitution. Seconded by Mr. Post and carried.

Mr. Dixon then presented the names of the following men, ex-members of their various classes, for the approval of the Executive Committee:

Orion O. Oaks, '05,
A. V. Johansen, '07,
S. X. Metzger, '09,
Edward Thomas Condon, Jr., '10,

and moved that the names of these gentlemen be presented to the Alumni Association of Stevens Institute of Technology at its next regular meeting for election to Associate Membership, contingent upon their making proper payment. Mr. Post seconded the motion, which was carried.

Mr. Peabody raised the question of the investment of the Association's funds and after discussion appointed a Committee on Investments consisting of Mr. Cuntz, chairman; Mr. Dinkel and Mr. Pryor, whose duty it shall be to report on the securities in which the funds of the Association are invested and advise on any changes deemed advisable.

Mr. Peabody reported for the Banquet Committee that they were holding frequent meetings and that all details for the banquet had been arranged. He said that the number expected to attend was about 700.

A suggestion was made by Mr. Kidde that there be a card on each table at the banquet or an insert in the menu giving notice of Alumni Day.

Mr. Peabody announced that he had written to the secretaries of all the clubs requesting the dates of their meetings, but the results had been poor. In this connection he urged that the clubs prepare a calendar of their meetings well in advance for the benefit of such alumni as might thus be enabled to affiliate with them and in order to avoid conflict of dates, and read a letter which he proposed to send to the secretaries of all alumni organizations to this effect.

Mr. Parsons spoke of ways and means of keeping the college spirit alive among the Alumni and cited the practice of Columbia University, where the classes after having been graduated a certain number of years, form in blocks of five for their reunions and class dinners, thus constituting little clubs. Sometimes these organizations meet at some down-town club for luncheon.

A motion was made by Mr. Cuntz and seconded by Mr. Post that suitable resolutions upon the death of Stephen S. Palmer, trustee of the

Stevens Institute of Technology, who died January 29, 1913, be drawn up, sent to the family and published in the INDICATOR. Carried.

There being no further business the meeting than adjourned.

A meeting of the Executive Committee of the Alumni Association of Stevens Institute of Technology was held at the Machinery Club, New York City on Wednesday, March 12, 1913, being called to order at 1 p. m. by President E. H. Peabody. The other members in attendance were:—J. H. Cuntz, F. J. Gubelman, J. A. Dixon, F. A. Muschenheim, W. E. S. Strong, H. E. Griswld, R. C. Post, L. A. Martin, Jr., and T. C. Stephens. The following past-presidents of the Association, Dr. Alexander C. Humphreys, R. S. Kursheedt, H. deB. Parsons and Henry Torrance, Jr., and the managing editor of the INDICATOR, G. E. Terwilliger, were also present.

The minutes of the previous meeting of February 4, 1913, were read and approved.

Mr. Griswold reported progress for the Southern Alumni Letter Committee.

On behalf of the Committee on Increase of Membership, Mr. Dixon then read his report, presenting the names of the following men for reinstatement to active membership:

C. E. Pearce, '91,
H. F. Richardson, 08,
A. DeLos Smith, '97,
J. H. Deppeler, '06,

and moved that these gentlemen be reinstated to active membership in the Alumni Association of Stevens Institute of Technology, and that they be sent by the Secretary proper notice of their reinstatement and acknowledgment of their remittance, also back numbers of the INDICATOR for the current year and privileges as provided by the constitution. Mr. Cuntz seconded and the motion was carried.

The names of the following ex-members of various classes were then submitted by Mr. Dixon to the Executive Committee to be passed upon for presentation at the next regular meeting of the Association for election to associate membership, subject to their complying with the terms of the constitution:

Warren Garwin, '05,
Hampton D. Ewing, '90,
W. Dirk Van Ingen, '13,

and he further moved that the names of these gentlemen be presented to the Alumni Association of Stevens Institute of Technology at its next

regular meeting, for election to associate membership, which motion was seconded by Mr. Stephens and carried.

Mr. Cuntz then read the resolutions on the death of Stephen S. Palmer which follow:

Whereas, It has pleased a Divine Providence to remove from the scene of his earthly labors Stephen S. Palmer, a Trustee of Stevens Institute of Technology; and

Whereas, Mr. Palmer, as President of the New Jersey Zinc Company and in other positions of great responsibility and wide influence has rendered important and valuable services to the engineering profession, and as Trustee of Stevens and other institutions of learning has notably furthered the cause of education: and

Whereas, He has shown his effective friendship for Stevens and for its President, Dr. Humphreys, by his liberal benefactions at critical periods in the history of our Alma Mater; therefore be it

Resolved, That we, the members of the Executive Committee of the Stevens Alumni Association hereby record our keen sense of the loss which the business world and the engineering profession, as well as the Stevens Institute of Technology have suffered by his death, and our deep gratitude for all he has done for our Alma Mater; and be it furthermore

Resolved, That these resolutions be spread in full on our minutes, and that a copy of them, suitably engrossed, be presented to his family, with our sincere sympathy.

The adoption of the foregoing was moved by Mr. Griswold, seconded by Mr. Strong and unanimously carried.

Reporting for the Committee on Life Membership Fund Investments appointed at the last meeting, Mr. Cuntz stated that the committee believes these investments are at present safe, but while deeming it inadvisable to make any change at this time, recommends that the stocks and bonds comprising these investments, and upon which the committee submitted a report in full, be closely watched. Upon the motion of Mr. Griswold and the second of Mr. Torrance the report was accepted with the thanks of the Association and ordered placed on file.

Mr. Muschenheim moved that the committee be continued with instructions to watch the investments and make such recommendations to the Executive Committee as they think advisable. This was seconded by Mr. Gubelman and carried.

By unanimous consent the Executive Committee then went into session as a committee of the whole to consider certain incidents in connection with the recent Stevens banquet. They reported back to the presiding officer that they had appointed a sub-committee consisting of Messrs.

Torrance, Humphreys and Gubelman to investigate the above and report to the President of the Association. It was moved by Mr. Griswold and seconded by Mr. Strong that the report of the committee of the whole be accepted. Carried.

Mr. Gubelman reported for the Publicity Committee and suggested that a card system on the accomplishments of Stevens men be established, cross-indexed as to subjects or lines of endeavor.

Professor Martin read a preliminary report on the financial result of the Stevens banquet. He moved that no money be refunded on dinner tickets, which was seconded by Mr. Gubelman and carried.

After discussion it was decided to hold occasional informal lunches for Stevens men at some down-town club, Mr. Kursheedt having moved to that effect and Mr. Post seconding the same.

The chair appointed R. S. Kursheedt, H. deB. Parsons, P. C. Idell, A. S. Lewis and E. O. Heyworth to attend to the details of the first lunch.

There being no further business the meeting adjourned.

ALUMNI TRUSTEES MEET

A meeting of the trustees of the Alumni Association at which were present E. H. Peabody, J. A. Dixon, Walter Kidde and R. W. Pryor, Jr., was held at the Engineers' Club, New York City on February 4, 1913. The proceedings of the Executive Committee at its meetings held December 10, 1912 and January 15, 1913 and those of the Association at the midwinter meeting held January 15, 1913 were ratified.

NEWS OF THE COLLEGE

DR. WILSON VISITS CASTLE STEVENS

Castle Stevens was honored by a visit from Woodrow Wilson on Sunday, January 26. A number of other persons of prominence were in the party, who comprised the week-end guests of Mrs. C. B. Alexander. The visitors inspected the lunch room and the alumni rooms, and then entered the dining room, where the students who were lunching, rose and gave enthusiastic Stevens yells for the President-elect. Dr. Wilson showed particular interest in the drawings representing plans for the Greater Stevens, which were reproduced in the INDICATOR for last October. The party included Mrs. Wilson, the Misses Jessie and Eleanor Wilson, Mrs. Alexander, Mrs. Robert L. Stevens, Colonel and Mrs. E. A. Stevens, Mr. and Mrs. Richard Stevens, Theodosius Stevens, Norman Hapgood, J. W. Rufus Besson, Dr. A. C. Humphreys, John W. Lieb, Jr., Walter Kidde, and E. H. Peabody.

DR. POND RESIGNS AS TREASURER

Dr. Francis J. Pond, for many years treasurer of the Athletic Association, recently resigned, and Prof. W. R. Halliday was appointed to succeed him. Since October, 1906, when he took office, Dr. Pond has had the satisfaction of seeing the surplus of the association grow from $67.46 to $3,000.

ENGINEERING SOCIETY ENTERTAINS

On the evening of February 28 the Stevens Engineering Society attempted something a little out of its regular routine, entertaining some thirty-five members of the Engineering Society of the Brooklyn Polytechnic Institute at the Castle. E. H. Peabody, '90, delivered a lecture with illustrations on "Marine Boilers."

ATHLETIC COUNCIL FORMED

The Stevens Athletic Council has been formed to control athletic matters in general at the college. The scheme was worked out after considerable consultation between alumni and undergraduates, and promises

much in the way of coördination between the various departments of athletics. The present members are President, H. A. Pratt, '04; secretary, R. H. Lansdell, '13; treasurer and athletic director, W. R. Halliday, '02; Dr. F. L. Sevenoak, Dr. F. J. Pond, J. S. De Hart, '90, E. Q. Horton, '05, D. N. Mauger, '10, H. P. Bender, '13, W. M. Kelly, '13, J. H. Vander Veer, '13, and L. T. Van Vechten, '14.

PROF. R. M. ANDERSON

Robert Marshall Anderson, '87, has been selected to fill the chair of experimental engineering, formerly occupied by Professor Denton. Professor Anderson will teach the Junior and Senior Classes, the courses covering boilers, steam engines, hydraulic machinery, air compressors, gas engines and turbines.

Professor Anderson received his early education in the public schools of Circleville, Ohio, and later entered the University of Notre Dame at South Bend, Ind., from which institution he received the degree of Bachelor of Science in 1883. After leaving Notre Dame he entered Stevens, graduating in 1887.

From 1889 until 1899 he was connected with the faculty of Stevens, first in the Department of Tests, and finally as Assistant Professor of Applied Mathematics. Since then he has had a broad engineering experience.

LIBRARY NOTES

George Iles has presented to the Library not only a copy of his book "Leading American Inventors," but also photographs of John Stevens, Robert L. Stevens, and Edwin A. Stevens. These photographs were taken from paintings now in the possession of Miss M. B. Garnett. Mr. Iles has also given the Library two of the Curtis Indian prints, which have been hung temporarily in the library at Castle Stevens.

Following are statistics for the year ending December 31, 1912, relating to the various Library interests:

Number of readers	12,538
Daily average during college terms	74
Books and periodicals taken for home and office use	1,054
Books used for reference in Library	2,084
Accessions by purchase	50
Accessions by exchange	4

Accessions by binding	171
Accessions by gift, including 451 pamphlets and 6 maps	691
Total number of accessions	916
Total number of books bound, including 20 rebound	232
Total cost of books purchased	$170.87
Total cost of binding 232 volumes	$236.50

SPRING ATHLETIC SCHEDULES

At Castle Point Field

April 9—C. C. N. Y. baseball.
April 12—Seventh Regiment, baseball.
April 16—Interclass Track Meet.
April 19—Swarthmore, lacrosse.
April 25—Union, baseball.
April 26—Rensselaer, baseball.
April 30—N. Y. U. Track Meet.
May 2—Cornell, lacrosse.
May 3—U. of P., lacrosse.
May 10—Lehigh, lacrosse.
May 17—Swarthmore, baseball.
May 24—Hobart, lacrosse.
Rutgers Track Meet.
May 30—Harvard, lacrosse.
June 10—Rutgers, baseball.

Teams Away from Home

March 29—Fordham, baseball.
April 2—Army, baseball.
April 5—Lehigh, baseball.
Crescents, lacrosse.
April 12—Johns-Hopkins, lacrosse.
April 16—Columbia, baseball.
April 19—Lafayette, baseball.
April 26—Harvard, lacrosse.
April 30—N. Y. U. baseball.
May 3—Crescents, baseball.
May 7—Rutgers, baseball.
May 10—Delaware, baseball.
May 14—C. C. N. Y., baseball.
May 30—Commonwealth F. C., baseball.
June 14—Rutgers, baseball.

STEVENS FOOTBALL SCHEDULE FOR 1913

October 4—Army, at West Point.
October 11—Haverford, at Castle Point Field.
October 18—Rensselaer, at Troy.
October 25—Johns-Hopkins, at Castle Point Field.
November 1—Delaware, at Castle Point Field.
November 8—Union, at Schenectady.
November 15—Conn. Agri. College, at Castle Point Field.
November 22—Rutgers, at Castle Point Field.

TAU BETA PI INITIATES

On March 29, the following Juniors were initiated into Tau Beta Pi: D. M. Hill, F. W. Isles, R. M. Mosier, and L. T. Van Vechten. The Junior Class is also represented in the honorary society by L. F. Bayer, who was admitted to membership last fall. The initiation banquet was held at the Hotel Chelsea, New York, Professor Ganz acting as toastmaster.

SLIDES ON SAFETY DEVICES

The Department of Shop Practice has been presented with a set of sixty stereopticon slides on safety guards and devices for preventing accidents in shops, the gift of the Illinois Steel Company, through the courtesy of its superintendent, W. A. Field, '91, and A. H. Young, supervisor of labor and safety. The views will be used in lectures to the Freshmen on the subject of Accident Prevention.

"BLAZER GIRL" PRESENTED

The Stevens Dramatic Society presented "The Blazer Girl" before a crowded house on February 6 in the college auditorium. The play was a musical comedy, written and acted by undergraduates. It was very well received and may be repeated under the auspices of the Alumni Association during Commencement Week.

SENIOR INSPECTION TRIP

The Senior Inspection Trip was unusually successful this year. The trip began by a visit to New York Edison Company stations on March 13, after which the students went to Schenectady, visiting General Elec-

tric Company's plant, and the American Locomotive Company's works on March 14 and 15. The party then proceeded to Niagara Falls, visiting the great electrical plants there. The party left for Pittsburgh on March 18, and there inspected the plants of the Westinghouse Electric & Manufacturing Co., and the American Steel & Wire Co., and Carnegie Steel Company near Pittsburgh. A portion of the party continued on to Washington. The trip was under the direction of Professor Ganz.

Edwin A. Stevens
At the Age of 49

From a painting in the possession of E. B. Cook, Esq., of Hoboken, by whose courtesy this portrait is here published.

Stevens Indicator

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FOUR VERSUS FIVE OR MORE YEARS OF COLLEGIATE EDUCATION*

By Alexander C. Humphreys, M.E. Sc.D., LL.D.
President, Stevens Institute of Technology.

UNDER the above title I have been asked to prepare a paper for this meeting. I shall confine myself to collegiate education in preparation for the profession of engineering.

Among educators there is a strong and growing opinion, I fear, in favor of extending the four-year course which, for some years, has been the standard in the United States. The lengthening of the course naturally is suggested as the remedy for the crowding of the curriculum which has as naturally resulted from the rapid advances in engineering science made in late years. This remedy is the one on the surface, but it by no means follows that it is the best remedy.

The differentiating of the engineering profession into so many specialties, which has been more and more in evidence in late years, has also been used as an argument in favor of the proposed change. This may be used quite as cogently as an argument against the proposition.

Here in the United States, while the more general proposition is to extend the undergraduate course to five years, there are not a few who favor extending it to six and even seven years. As the claims are presented for more advanced study

* Paper read at the Minneapolis Meeting of the Society for the Promotion of Engineering Education, 1913.

in some branches, and for the inclusion in the curriculum of new subjects, it is to be expected that those in authority will take the path of least resistance, and so propose that the students shall submit to a further reduction of the portion of their lives remaining to be devoted to productive effort. Particularly is this suggested remedy to be expected from the heads of the departments directly concerned.

The same tendency is to be seen in our every day life. As our needs, or our luxuries which we often mistake for needs, increase, the remedy at once suggested is the securing of an increase of income. In this case we might well consider two questions:

Will our lives be more complete if the new wants are satisfied? Cannot the income already in hand be spent to better advantage? May we not apply these tests to the question before us?

Will our students be more completely equipped for their life's work by giving them additional collegiate education? Not necessarily. Because there is a need, and a growing need in our profession for more instruction and training than can be covered in a four-year college course, it by no means follows that the colleges must charge themselves with the entire responsibility thus indicated. Have the colleges of engineering at any time in their history given their students a complete training for life's work and responsibility? The question needs only to be asked to be answered in the negative.

The college training in engineering is of great value to the one who takes advantage of his opportunities. The college affords the opportunity for acquiring a sound *fundamental* training within the shortest time and with the least expenditure of mental and physical energy. But this college training is not a necessity in the case of the men, perhaps exceptional, who have the brains, physical strength, and determination, to persist in the face of difficulties.

Let us not forget that in every walk of life there have been and are now to be found men in the front rank who never had any college training and some who had little school training. It is true these were or are extraordinary men and must not be taken as patterns in planning for those of average capacity. But at least we can learn from the careers of these men that education can be obtained outside of academic surroundings.

Then should not the man of good ability and character be able to study effectively by himself after four years in college, following the years spent in the primary, grammar and high schools? Certainly he should be, provided he has been taught how to study and reason rather than crammed with facts and information.

Is it not a fact that if he were to become a master in any branch of the engineering profession, the student, in the past, found it necessary to make himself proficient and efficient after he had graduated from college? If this was true in the past, are the present conditions so different that in the four years of undergraduate work the student cannot acquire a sufficient grasp of science and mathematics as will enable him to reach the highest attainable rank *for which his personality qualifies him?*

No doubt some of those who graduate after four years will not, and perhaps could not, build a sufficiently high and strong structure on their college foundation to enable them to reach the loftiest heights of professional eminence; but this proves nothing. This measure of success involves more than formal education; it involves the questions of natural ability and character. Furthermore, there is not room for all at the top.

Are not we of the engineering colleges too apt to be led astray by thinking that we must turn out a finished product? Is it not true that too many educators believe, or at least act as if they believe, that all education is to be secured only

within the school, college and university? A great many believe, or act as if they believe, that all culture must be so secured.

When the question is put to us squarely, we must all admit that this is not true, even as to culture. Certainly then it cannot be true as to technical education. Let us be frank and go farther and acknowledge that there is much which the engineer needs, if he is to gain eminence in his profession, which cannot be acquired in college, though he were to remain there to the end of his days. The college may develop scientists but it remains for the school of experience to complete the training of the engineer, as far as it can be completed.

This question of the extension of the undergraduate years of study cannot be intelligently considered until we give adequate credit to the opportunities afforded by the combination of practice and study in the school of experience. If we are persuaded that some time should be added to the undergraduate course, how much time shall we add? Will one more year meet the demand created by the advances made and being made in engineering science? If not, will two years, three years, four years, five years, enable us to give our students a complete knowledge of all that is comprised within the limits of any one major branch of the engineering profession? We have only to consider the limitations to the knowledge of those who have devoted a life time to study in one branch of science to force us to negative this question.

Is it not true that if a man spent a life time within the college walls, when he found himself dying of old age there would remain much for him to learn? As a general proposition, is it not also true that as his time as a college student was lengthened, he would become less and less capable of applying his knowledge of science and mathematics practically and commercially? And here let us not forget, if we exclude the military branch of our profession, he is not an

engineer who is incapable of meeting the conditions of fair commercial competition. I am prepared to go much farther and say that as there are two sides to every question, there are two sides to the question of college training even when limited to the four years. While unquestionably, in the case of those naturally qualified for advanced study, the balance is in favor of the college training, there is a minor disadvantage to be reckoned with, and this increases with the years spent in college. This disadvantage is the too great reliance which the *student* places on his college training and his failure to recognize and keep constantly in mind that his college work is only preparatory at the best. Furthermore, with weaker natures, the longer a man remains a student, only the less is he qualified to battle with, and the more he shrinks from, the stern realities of life.

Now let us briefly consider the second test question. Can the time now spent in school and college up to graduation from the four years college course be spent therein more economically and efficiently? In considering this question we include the preparatory work in the graded schools.

The first thought that here comes to my mind is that the men who graduate from the Stevens Institute of Technology, average in age about 22½ years. It would seem as if a man should be a producer as well as a student at that age—a student he must remain in any case.

If we are to criticize the work of the schools in preparing our material for us, we must be sure that we are using our four years to the best advantage. Are we doing so? I believe that in some of our engineering schools we cannot do much more than we are doing. Certainly we cannot do better by crowding more into the curriculum. In some cases better work can be done by attempting less; by giving the students greater opportunity for assimilating that which is offered.

Perhaps the best opportunity for a more effective use of our four years is in the coördination of the several branches

of study. Those in authority must be alive constantly to the necessity of watching for and providing against the over development of any one subject and the unneccessary overlapping of two or more subjects. A course in engineering, or any professional course, can be kept in balance only by constant effort on the part of those in authority, and the loyal coöperation of the whole teaching staff. The conscientious, ambitious professor especially is inclined to increase his demands on the students and so rob the other professors of their share of the time and energy of the students. This is particularly so with a professor of engineering who is fully alive to the progress being made in his specialty. Here it is to be remembered that, with a class already working to a reasonable upper limit, if some new illustration of principle is to be introduced, it must replace some other illustration to be abandoned. Frequently this can be done without any loss educationally.

One thing is certain—just so soon as we give our students more to do than they can do thoroughly and with some degree of comfort and satisfaction to themselves for work well performed, we are not working them efficiently.

The question will here be raised—What grade of capacity and ability shall we take as a standard? Shall we adapt our requirements to the brilliant student, the student of good average capacity, or the student who learns slowly?

We can at once eliminate those who are lazy, indifferent, or who pay *too much* attention to athletics or other student activities or any other interests than those connected directly with the course of study. I say too much attention to these other matters because I believe the students should be encouraged to give some of their time, thought, and energy to student activities. We can sympathize with the earnest student who learns slowly, but it is not fair to hold back the majority for his benefit. He must take an extra year if necessary to complete the work of the four years. Of those

who are naturally qualified for the engineering profession and are really in earnest and ready to devote themselves conscientiously to their studies, there should be comparatively few to take this extra year. If there are, it is a warning that the work of the several departments should be investigated. Certainly we cannot fairly adjust our courses to the exceptionally brilliant men. Nor need these men feel that they are losing time by having to mark time to enable the average men to keep in line. There is plenty for the brilliant men to learn and do if they have spare time and are willing to employ it sanely. On the average, I think those who come midway between the extremes named must furnish us with our gauge. And it is not unlikely that a large percentage of the really successful engineers will come from this section. They often make up in common sense what, by comparison, they lack in so-called scholarship.

While I do not look for any great improvement in the case of some of our colleges through a more efficient employment of our four years, I do believe that some educators who are warm advocates of extending the four-year course would do well to examine themselves and their teaching carefully and frankly to determine if they are doing their best for their students in the time allotted; and especially *if they are loyally coöperating with their associates* in *securing* and *maintaining* the highest attainable coördination of the course as a whole. I am inclined to believe that a completely competent investigation of our colleges along these lines might be highly instructive and point the way to increased efficiency.

Now let us for a moment turn to the question of the quality of preparation as furnished by the graded schools. Is there one among us who believes that it is what it should be, or even what it might well be if we would throw away our prejudices, stop boasting, and really coöperate to improve conditions? At least let us not attempt to avoid responsibility by sticking our heads in the sand.

The first step should be to eliminate politics. A hard step to take in a country such as ours. If we cannot eliminate this dangerous influence, let us be frank and brave enough to acknowledge its presence wherever and whenever found.

The greatest fault, in my opinion, is that we hold the college out as the goal for all. We even deplore the fact that so few of those who enter the public schools, and especially the high schools, go on to the college. No doubt it is a cause for regret that certain ones do not go forward, but is it by no means a cause for regret in the case of the great majority. Many a good clerk has been spoiled by trying to make him into a teacher, lawyer, doctor, or minister. Many a good mechanic has been spoiled by trying to make him into an engineer. And I am speaking from experience outside the college as well as inside. Our object should be to educate the masses for self-support and so for self-respect. This would work no hardship to those going forward to the college; whereas the present system does work a hardship for the great majority.

Another fault is that we do not regard with sufficient respect the duties of the teachers in the primary grades. They should not be considered as teachers of lower rank. If they do their work efficiently, the problems to follow are greatly simplified. It is natural that the teacher should try for the step which is regarded as promotion. It is unfortunate that so much of the poorer teaching material is saddled on the primary grades.

A decided advance towards the solution of the problem we are now considering would be made if there could be a material increase in the salaries of our public school teachers, especially in the primary grades. And then there should be a commensurate increase in the required qualifications, and particularly in the *ability to teach*. There are many teachers and professors who possess but little of this ability. They

may know, but they cannot make others know. Many of these misfits are temperamentally disqualified from doing the work of the classroom.

First of all, then, the pupils of our schools should be thoroughly taught and drilled in the "three Rs" and other fundamental studies. And here I am not speaking of preparation for any particular line of study to follow, but for the future in any line of effort in study or for self-support. I am afraid that we of the engineering colleges allow ourselves to forget that the lack of complete *facility* in reading, writing, adding, subtracting, multiplying, and dividing, is a constant handicap to the student, pressed as he is for time. It is like giving a mechanic a poor set of tools and requiring him to perform his task accurately and *on time.* I am old-fashioned enough to believe that in our efforts to make the school studies less wearisome, we are weakening the students as to their powers of concentration and perseverance. This and the crowding of the curriculum have unquestionably led to superficiality.

There is also room for improvement in the matter of discipline. Our children should be taught to do right because it is right; failing to respond to this treatment, they should be taught that they must do as they are told to do. As far as possible they must be taught to govern themselves. Failing in this they must be governed. This would help in no small degree in better preparing for life's work, including collegiate study.

Here, as in every well-considered scheme, educational or otherwise, extremes are to be avoided and balance is to be sought constantly. Let the children from the first be taught to find pleasure in work well and thoroughly performed, not in work easily done. Time and energy might be saved by reducing the demands for memorizing facts. Let this line of instruction be kept to a minimum and the children early taught how to find their facts and reason correctly therefrom.

I know it is argued by many experts that the memory must be cultivated. Again it is a question of balance. The brain can be so overtaxed as to be distinctly injured as a memorizing machine. Some are endowed with wonderful memories, and this is a most convenient tool for rapid and easy execution. But I have often found that unusual memorizing ability is not coupled with capacity for sound reasoning. Here and in other places I shall be misunderstood. I can only repeat, I am arguing against extremes, knowing positively that in too many cases extremes are in control.

After all, the proof of the pudding is in the eating. The average age of those entering Stevens is about 18½ years. Many high school graduates fail to pass the entrance examinations, and fail in the fundamentals. When we compare with the age at which the A.B. degree used to be taken, it is evident we have extended the years of preparation. Is the improvement in preparation commensurate with the years added? My answer is an emphatic "No."

Certainly, when we consider that we do not graduate our men until, on the average, they are over 22 years of age, we should very seriously consider every step of their educational progress, from the primary school forward, before we further reduce the working life of our young men. Especially should this point be conscientiously considered when we reflect that adding to the years in school and college *tends* in some directions to make the student less effective as a practitioner. Again a question of balance.

In connection with our investigations looking to greater economy in time, we may well keep our minds open on the question of coöperative education as practiced for many years in the University of Glasgow and, as now well under way in a somewhat different form, in the University of Cincinnati. There are arguments for and against this scheme. The question is—which have the greater weight? Certainly the plan has the great advantage of combining practice with

theory—the advantage which the graduate has, if he will avail himself of it, in studying while he practices. The results obtained by the Glasgow University speak well for their system.

The economic questions which are pressing for solution today and which threaten the peace and prosperity of the country, place a great responsibility upon the engineer, for he should be capable of giving material aid in the solution of these questions, so many of which have to do with the industries and public utilities. But we find the engineers of the country frequently wide apart on fundamental questions which are referred to them, and generally because these men have not been sufficiently trained on the investment feature of engineering. Engineering practice cannot be divorced safely from sound business practice. The weakness is evidenced in the attitude of bankers towards engineers' estimates on construction and earnings therefrom. While conditions have improved of late years, because the men who control the money are more careful in selecting their technical advisers, we still hear the criticism, "Is that an engineer's estimate? Then add at least 50 per cent."

This may be considered an argument for extending the course. But better less theory, as long as it is accurate as far as it goes, and greater capacity for commercially practical application. At least let our students be taught that before or after graduation they must learn what the capable clerk has been learning outside the college during the college four years; and especially that he must learn the *principles* of accountancy, including such matters as depreciation; analysis of records; specifications and contracts; elements of banking, and the like.

Apart from the demand for more time for the engineering course, there is coming to be a demand for a longer undergraduate course so that more time may be given to the so-called cultural studies. Are not too many of the professional

educators particularly inclined to act on the belief, even if they do not hold to the belief under cross-examination, that the cultural studies are to be distinguished by labels, and that this intangible something we call culture cannot be acquired outside of the college or university? I do not propose here to be misunderstood as I have been at times. I believe the engineer requires all the culture, breadth of judgment and sympathy with his fellows that he can acquire or cultivate. Certainly he needs these as much as the member of any other profession; but the culture may not always take the same form. I have met people who were cultured in the ordinary acceptance of the term, who were out of touch and out of sympathy with the world in which and by which they were living; who had a store of knowledge, but with little ability to use it for their own good or the good of others; and who were unable to form a sound judgment based upon the stuff stored in their brains.

The strictly engineering studies can be so presented and taught as to have a truly cultural value. Do not let us extend our courses only for increase in opportunity for culture, unless we are sure of our ground.

In estimating the educational equipment of our graduates, let us compare, not with what we think we know and can do after ten, twenty, or thirty years' experience since graduation but with what we actually knew and could do on the day of graduation. Here is a mistake frequently made by the practicing engineer as well as by the educator.

It is quite in order that I should say a few words about post-graduate study. I have been misunderstood as condemning post-graduate study, and particularly at a dinner last winter given by the alumni of one of our colleges of engineering. For those temperamentally and otherwise qualified for the work, I believe thoroughly in college post-graduate work in engineering. Those men are the exception. Many who take up this work would do better if they went out into the

world to try to earn a living by putting into practice what they have learned in college. I am most firmly of the opinion that after four years in college the great majority of graduates would do better by securing their post-graduate training while practicing their profession. Even research work of the highest order is being done by men so engaged. The colleges are constantly profiting by the results thus obtained, carried back to the college for the benefit, not only of the undergraduates, but of the post-graduate students and even the professors.

But again there is the confusion of terms so common in the United States. What is post-graduate work *in engineering?* We hear that certain institutions are carrying on post-graduate work in engineering, when, upon investigation, we find the engineering studies are only those included in the regular four-year course. The post-graduate feature consists in the requirement that the students shall have first taken their A.B. or the equivalent. This is, in a sense, post-graduate study, but it is certainly not post-graduate study in engineering. The institutions which claim thus to do post-graduate work in engineering are, consciously or unconsciously, deceiving the public. All of our engineering colleges of first rank receive students who have taken their A.B., but I have never heard it claimed that these men are doing post-graduate work in engineering. One advantage these men have over those who are taking the so-called post-graduate studies first referred to is that instead of being in a class by themselves they have to keep pace with men who are required to work diligently if they are to graduate, and so they in turn are forced to apply themselves in a way which they probably had not been required to do in their previous college work. They have a better chance of acquiring habits of industry.

In conclusion, let me suggest, it is because so many college men allow themselves to be found advocating views, which

at least appear to favor the claim that the college and university hold a monopoly of all educational forces and agencies, that the opportunity is furnished for the attacks on the colleges and institutes of technology, such as those voiced by the late R. T. Crane, of Chicago. The extreme statements on the part of the college man bring out still more extreme statements on the part of the self-made man. Again it is a question of balance between two extremes. Let us think seriously of this before we decide to hold our students longer away from the educational advantages offered by the school of practice and experience.

THE NEW ELEMENT IN THE ART OF MANAGEMENT*

By John Calder

THE new element in the Art of Management is the conscious adoption as a basic principle in the economic control of men, mental operations, apparatus and materials of what has long been known as the "Scientific Method." Its industrial applications cover a very wide field, and the writer ventures to define the new element briefly, but broadly, as:

> the critical observation, accurate description, analysis and classification of all industrial and business phenomena of a recurring nature, including all forms of coöperative human effort and the systematic application of the resulting records to secure the most economical and efficient production and regulation of future phenomena.

In other words, all repeated experience with men, things and schemes in industry is criticized, carefully verified and duly recorded, and, by the use of the three methods of logical inference, viz.: Analogy, Induction and Deduction, is made to yield fresh results ready for application wherever they are economically justified.

The latter proviso is very important, and due regard must be paid to it if the "Scientific Method" is to be wisely applied to industrial problems. Nothing is a "result" in Science which is not "true," and such results are welcomed for themselves.

In the arts, however, "utility" is the only justification for expenditures on the scientific method and there are

* A lecture delivered to the Senior Class of Stevens Institute of Technology.

quite a few of its results which cannot be applied with economy to the actual conditions of industry.

The ability clearly to perceive and avoid such a contingency is frequently absent in men who systematize without a thorough shop experience. In such cases a wise management will avoid attempting to establish a science for irreconcilable variables or infrequent phenomena and will fall back upon an empirical, but none the less, "common-sense" solution of the problem.

The element which is new in its application to management is one which has always characterized the sciences, whether pure or applied, but has not usually influenced the arts based upon these sciences. This was chiefly due to three causes; the neglect of the practical utility of the scientific discipline by those possessing it; the prevailing custom of leaving the executive side of the arts in the hands of those with no scientific education; and a popular belief, still widely held, that the mass of the commonest daily industrial experiences and problems cannot be satisfactorily analyzed and reduced to scientific terms.

The particular procedure just defined, of observing, verifying and classifying every kind of phenomena, is quite old, but its consistent application, even in the sciences, has been a progressive matter. It attained its greatest impetus and extension in the last century under the stimulus which the evolutionary theory gave to every branch of science. It influenced greatly—particularly in Germany—the research work underlying the arts, through the increasing employment of men with true scientific training.

As a result the technical processes of many industries were much improved, but, in spite of this, the actual management of the arts themselves and of the artisans was practically unaffected by scientific considerations. At that time observed differences in efficiency of plant operations were due largely to the varying ability of managers. In 1897,

sixteen years ago, there were signs that technical education was increasingly furnishing for practical control of the arts, as distinct from laboratory work, men with the scientific discipline and a passion for facts. This was the unformulated and largely unnoticed beginning of the New Element in Management, not a few of the younger shop executives having been mentally prepared for the advance before it had taken practical shape or been accorded recognition by the owners of businesses.

Initially, and still inherently, the advance was *not* specific new shop methods or new "systems." It was a new mental attitude towards practical problems by a small but increasing body of administrators, who regarded such questions as no longer outside the pale of scientific solution. Five years later the earnest desire for the truth about business began to be reflected in the technical press and in the proceedings of the professional societies, both here and in Europe.

An analysis of such publicity, which the writer made at that time, showed that the directors of the metal working trades in particular had followed the path of least resistance and applied the new method largely from the accounting side. The resulting more reliable inventories and costs brought out the facts of inefficiency to a limited degree and started some reforms, but comparative costing alone could not establish standards of shop performance and methods of attaining these. The accountant, though first in the field, had yet to be supplemented by the experienced Engineer with an all-round discipline and the new viewpoint of the problems of management. The temporary recession of business prosperity in 1903 increased the interest in the rise of the new movement, which was seldom consciously "scientific," but was, nevertheless, actually so and held in it the germ of all that has followed.

The new "element" in the Art of Management has been defined as the use of the "Scientific Method" in industry.

The general "problem" of industrial establishments, however, is first and last economic, and may be compressed into a single sentence. It is: "To furnish daily the prescribed quantity and quality of product in all its varieties by the most efficient shop and labor arrangements and with a minimum of fixed and cash capital locked up in the process."

A productive organization and a system of plant management which will accomplish this and continue to do so with harmony and to the satisfaction of employer and employe alike is the desired end.

Without assuming any finality about the precise elements which arise out of the application of the "Scientific Method" to the greatly varying problem of management just defined, it may be said that certain regulative principles are fairly apparent and underly all successful practice. These may be briefly summarized here: The "critical observation, accurate description, analysis and classification" of the "Scientific Method" already defined furnish comparative data in the form of verified experiences.

In problems of management such experiences and their economical results are derived from observing three classes of industrial phenomena:

(1) The economic results of different arrangements and forms of materials and of operations upon them, either to produce equipment or product. This covers the whole field of recorded experience from invention and design of product and tools down through the successive shop processes to ultimate finished product and the tests of same in service. It is the object of the "Scientific Method" to make the best of this experience in its essential details, readily available for all concerned, and to see that it is actually absorbed and put in practice.

(2) The economic results of varying executive methods for effectively directing human efforts as a whole in the use of the above experience. This covers the entire field

of building up, coördinating and controlling the supervising organization of a plant, with its statistical and recording systems.

(3) The economic results of steps taken to raise the industrial efficiency of the individual worker in every grade of service. This covers the whole problem of labor, reward, intensified ability, conserved energy and the general relations of employer and employe.

By analogical, inductive or deductive reasoning on these experiences and the date derived from them, it is possible in many cases to frame a scientific basis for the most economical handling of recurring business and industrial phenomena; the chief divisions of which are outlined in the review of the past ten years, which follows. All of these divisions are concerned with the results obtained from scientifically coördinating experience with materials and schemes of operation thereon, from executive success in the general control of human forces and from raising the efficiency and economic status of the individual worker. To the uninitiated the possible results may seem out of proportion to the cause, but the painstaking, critical examination of the facts of experience with the aid of human invention may in the end do for the management of industry what it has already accomplished in the great circle of the sciences.

Ten years ago the recognized divisions in management were being modified, more or less consciously, under the influence of the "Scientific Method." These divisions were chiefly as follows:

Invention; purchasing; selling; accounting; costing; stock keeping; shop instructions; stock routing and tracing; warehousing and shipping product; the division of labor in all efforts, intellectual, manual and mechanical; the improvement and standardization of designs and product and of the whole equipment of industry-buildings, machinery,

producing tools and operating methods; the study of tasks; the division of supervising functions; the various labor reward expedients and incentives and the improvement of industrial hygiene.

These divisions remain intact today, but in practically all of them the "Scientific Method" has made itself felt and marked developments in detail have taken place. In varying combinations these divisions have appeared in specific "systems" during the past decade, combined usually with some special method of labor reward and incentive, but essentially they are all industrial practices of long standing, which have been left uncoördinated and undeveloped by the large majority of plant owners.

Early in the movement for greater efficiency considerable gains were made in some general machine shops through adopting, as far as possible, intensive methods of production, which had long been common in repetition work industries. These had little or no scientific origin, but the results were often far in advance of average practice, and in the course of long trial they closely approached the best scientific performances obtained by quicker and more direct means.

In able hands the intelligent and effective use of these divisions led naturally to intensified results and economics, but the essence of the new departure was something apart from progressive imitation. It consisted in a program of deliberate reconsideration of all the details of shop practice, using the thoroughness and disciplined judgment of the "Scientific Method" already defined.

It was at this stage of the movement that a number of accountants, followed by a few engineers, specialized in the promotion of industrial efficiency and from time to time, published their "systems" or particular methods of coördinating in detail the divisions of effort already named. Foremost and most important of these "systems" was that now termed "Scientific Management" which F. W. Taylor

advanced in 1903 as an outcome of his long continued and valuable researches into the art of cutting metals.

In many ways his experiments differed in no scientific essentials from numerous previous investigations for determining other mechanical and physical constants, but the large number of variables rendered his labors exceptionally difficult and tedious and had hitherto deterred engineers from attempting a solution. They led in particular to a scientific re-arrangement of men, materials and operating methods, upon which he based the generalization that the laborious and expensive task of framing a true science for every element in industrial problems was not only possible but an absolutely necessary preliminary to securing the highest efficiency. Mr. Taylor went further and claimed that the main elements of his experimental methods were identical with those required for the solution of a vast number of other, and quite different shop and business problems.

Mr. Taylor's notable and generous contribution of ten years ago to the literature and science of management did more than anything else to focus attention on this important subject and has rendered invaluable aid to the modern efficiency movement. Many, however, who are convinced that the application of the "Scientific Method" is the inevitable and natural course in the evolution of industry and of business, are by no means agreed that Mr. Taylor's solution, or indeed any of the formulated "systems" which have followed it, are equal to the requirements of industry as a whole. They believe that the range of current dogmatizing has exceeded the evidence; that before adequate and general formulation can be made it is necessary to continue for some time applying the "Scientific Method" to a larger variety of industrial problems. This should be done untrammelled by any hypothesis or by the stereotyped elements and details that quite naturally form the

scaffolding, and sometimes the only original parts of various "systems," which have solved more or less successfully a few specific cases.

What then have we to show for ten years' progress in the economic administration of industrial establishments?

Apart from natural progress in the suitability and efficiency of buildings and equipment, helped considerably by the scientific view-point of what is desirable, by Mr. Taylor's researches and the later inventions of others, there is not a great deal visible upon the surface, and the bulk of our industrial plants have still to respond in their details of management.

Nevertheless our shops now possess in their executives of all grades a much larger number of men possessing both the scientific and practical discipline, and need only the benefit of competent counsel and leadership to make a considerable advance during the next few years.

All of the elements already named are regarded in our progressive plants in quite a different light from ten years ago. They are being developed scientifically and are being used from every angle as reliable and valued aids in production and management.

Statistical information formerly carelessly gathered and seldom consulted is now accurately recorded for definite economic uses. Similar progress is found in the whole range of topics already cited as covering plant operations. In a word, a foundation has been laid, necessarily largely out of sight, which like all such work seems to the impatient to have had more than its proper share of attention, but those carrying the burden of administrative responsibility, and realizing the far-reaching character of the movement, are not disappointed.

If the "passion for facts" is not allowed to be dulled by the natural tendency to stereotype the methods of attacking industrial problems, gratifying progress along scientific

lines is sure to be recorded during the next decade. As in all true science, existing hypotheses and generalizations, which have done good service in concentrating thought, will be gradually modified to cover the large range of experiences which have not yet been taken into account by the pioneer constructors of "systems."

Such a program as has been outlined by Mr. Taylor, for instance, is a formidable task to carry out simultaneously with the rapid growth of industries and plants. It can barely be said to have made any impression outside of machine shops, and it has gone only a short way in these. But this does not reflect upon the "Scientific Method," which must always face very different conditions in industry from those met with in science, and must constantly yield to and be measured by considerations of ultimate utility, of available capital and of current product and profit.

It is futile to expect any future in industry for any schemes of management or elements of such, however ingenious, which utilize science after all to smaller advantage for the investor than less pretentious measures. These, of course, may frequently be engaged in for the sake of consistency by a zealous systematizer without restraining practical judgment. Nor is it often desirable, considering the vicissitudes of business, to commit any one concern to a very elaborate program of reorganization involving years of transition experiences and expenses.

It is still needful for men believing in the "Scientific Method," but more conservative and experienced than the ardent systematizer, to hold the reins of business and guide the team. The commercializing of professional counsel on system demands this warning, for it has led not seldom to predictions and implications which have proved anything but "Scientific" in respect to their accuracy and insight.

The "Scientific Method" is no one's invention or copy-

right. It should not be kept in a forcing frame any longer by special practitioners, but should compete without privileges with the other methods which we believe it is well fitted in many cases to supersede.

The element of mystery has departed from the practice of systematizers, the best of whom merely concentrate on the facts of a given problem and out of a wide experience in coördination and practical responsibility work out solution by the "Scientific Method" appropriate to the material and human factors involved.

Such a result, conscientiously and competently obtained for a problem justifying the study, is well worth the laborer's hire.

In the earlier days of professional systematizing much was said of the gains to be made by those possessing the experimental results with the new tool steels, but for one shop problem, aided by this special knowledge, there are a score on which the systematizer of narrow experience has more to learn than the competent shop executive.

Where the former has the advantage, is not so much in his technical knowledge, which is being diffused rapidly, as in his mental detachment from current shop responsibility and his opportunity to concentrate his observation and reflection on one particular issue.

No managements can expect results from the use of the "Scientific Method" where they are unwilling to provide for this specialization by competent members of their own staff or by outsiders.

Among observed undesirable characteristics of systematizing practice the following may be mentioned:

(1) The publication and quotation of statistics regarding gains made through the use of particular systems, without a frank statement of the degree of inefficiency of the plants before re-organization. Proprietors do not need claims of 100% to 200% increase of product from the same equip-

ment to interest them in the movement. They do require, however, to have some reliable information as to the condition of affairs out of which such results were obtained. Where the plant was very inefficient the significance of the results is much reduced.

(2) The failure to view the plant from the investor's standpoint rather than as a laboratory offering opportunities for interesting and expensive experiments.

(3) The failure to admit that every application of past solutions to unstudied new and different conditions *is* an experiment.

(4) The waste of time and money by the too eager systematizer on problems which will yield to scientific treatment, but which do not recur often enough to justify such a solution.

(5) The undervaluing of effective leadership in management and consequent lack of permanency in results.

(6) The overvaluing of emasculated "system" leading to a curious non-responsibility on the part of any person for the total result.

(7) The frequent assumption that the treatment of the problems of similar plants should be identical.

(8) The failure to properly appraise the value to a growing concern of its internal asset of "good will."

(9) The imperfect analysis and appreciation of "the human factor" in industry causing failure to reckon patiently with "habit" and "inertia" and a tendency to hasty "substitution" and the breaking up of valuable organizations.

These are all mistakes of men lacking tact, ability and experience, but full of enthusiasm for the new methods.

Yet none of these failures weakens the case for the judicious application of the "Scientific Method" to the problems of industry, either directly by a sympathetic man-

agement or by competent counsel specially hired for the purpose.

But the difficulties encountered through temperamental and other defects in the agents used are not the only obstacles to be removed.

The idea, assiduously fostered by the first professional systematizers, that valuable data on machine tool performance, which they alone possessed, was for sale, still prevails in the minds of the less progressive plant proprietors. The latter have sometimes sought to purchase just so much of the magic formulae without attempting to understand the real nature of the service which the "Scientific Method" offers.

Such owners, sometimes under the influence of injudicious promises, have entertained extravagant expectations and have been correspondingly and unreasonably disappointed.

There is perhaps no better service which a professional engineer of high standing could render than to circulate reports and information which will convince plant owners and executives that the "Scientific Method" opens up no royal road to success, but is simply the most direct and reasonable course towards efficient control of industry and the guarantee of steady evolution in the same direction.

COMMENCEMENT WEEK

WITH the exception of Alumni Day, the exercises of which were marred by rain, fine conditions prevailed for all the events of Commencement week. The festivities began on Friday, June 6, when Calculus was tried, condemned and sentenced to horrible punishments at the hands of the sophomores in much the same fashion that this elastic old gentleman has borne the torments of undergraduates for decades past, only to reappear the following autumn ready for a new set of victims. The customary court scene was enacted, and a parade held which was featured by many transparencies depicting the foibles of the faculty. A monster funeral pyre awaited the convicted demon of mathematics.

On this same evening the annual reunion dinner of past *Stute* boards, together with the incoming staff, was held at the Castle.

Saturday was Alumni Day. A description of its festivities appears elsewhere.

On Sunday Bishop Lines preached the Baccalaureate Sermon to the seniors in cap and gown, at Trinity Church. The faculty and trustees in academic costume were also present in a body.

The Class Day exercises of the seniors were held on the lawn at Castle Point at 10.30 o'clock on Monday morning. A feature of the affair was the presentation by the class of $812.50 to the Gymnasium Fund. The exercises were also out of the ordinary in that President Humphreys spoke by special request. The formal program was as follows:

Part I

Sunshine Girl . . . . *Rubens*

Class History,

J. H. Vander Veer

Pirouetti . . . . *Finck*

Address of Welcome,

C. K. Steins

Un Peu D'Amour . . . . *Silesu*

Presentation of Class Gift,

J. H. Vander Veer

Firefly . . . . *Friml*

INTERMISSION

Part II

Blazer Girl . . . . *W. C. Russ, '13*

Class Prophecy,

G. G. Potterton and H. F. Gremmel

Because . . . . *d'Hardelot*

Class Dispensary,

H. P. Bender and R. G. Humphreys

La Boheme . . . . *Puccini*

Refreshments Music Selected

Muller's Orchestra

In the afternoon there was a lively baseball game between the faculty and the seniors, the latter winning 11–10 in the tenth inning. President Humphreys umpired, and it is reported that it took the best efforts of the Student Council to prevent rioting on behalf of players and spectators over some of his decisions.

Monday evening the annual meeting of the Alumni Association was held in the College Auditorium, a more extended account of its proceedings being given on another page.

The forty-first annual Commencement was held in the Auditorium on Tuesday morning, at 10.30 o'clock. James Mapes Dodge, past president of the American Society of Mechanical Engineers, was the recipient of the honorary degree of Doctor of Engineering. The program of Commencement was as follows:

Class Day Exercises on Lawn at Castle Point

Trustees, Faculty and Class of 1913

March—"Aida" .... *Verdi*
Prayer,
Rev. Malcolm A. Shipley, Jr., B. D.
Introductory Remarks,
Alexander C. Humphreys, M. E., Sc. D., LL.D.,
President of Board of Trustees and Faculty
Salutatory Address,
Peter Rudolph Aronson
Sextette—"Lucia di Lammermoor" .... *Donizetti*
Awarding of Prizes,
Conferring of Degrees—Presentation of Candidates,
Professor Charles F. Kroeh, A. M.,
Secretary of the Faculty
Waltz—"Southern Roses" .... *Strauss*
Address to Graduating Class,
William Wilson Finley, LL. D.
President, Southern Railway Company
Selections—"Geisha" .... *Jones*
Valedictory Address,
Jerome Strauss
Benediction,
Rev. Malcolm A. Shipley, Jr., B. D.
March—"La Guapa" .... *Buisson*
Music by Lander

The Degree of Mechanical Engineer was conferred on the following members of the Senior Class:

Henry John Appert, Jr.
Peter Rudolph Aronson.
John Alexander Austin.
Gerald Lee Bassett.
Kenneth Harding Bedell.
Harold Philip Bender.
Charles William Berghorn, Jr.
John Mark Birkenstock.
Robert Culver Blakslee.
John Winslow Bogert.
Ralph Knudsen Bonell.
Thomas Percy Bradshaw.
Jacob Herbert Bräutigam.
Bobert Cooper Campbell.
John Collins, Jr.
Frank Stevens Darke.
John Jacob Ehrhardt.
Theodore Rudolph Eilenberg.
Henry Gustave Fallerius.
Alexander Forbes, Jr.
Arthur William Frundt.
Henry Frederick Gremmel.
Ernest Marcus Hammerschlag.
Vernor Seton Henry.
Walter Oscar Hoermann.
Russell Garretson Humphreys.
Herbert Spencer Hunt.
William Lewis Iliff.
Arthur Edwin Jones.
Walter Morton Kelley.
Chester Lyman Kingsbury.
Frederick Charles Kipper.

Robert Hall Lansdell.
John Leicester McGuinness.
Thomas James McLoughlin, Jr.
Harry Winchester McQuaid.
Nichol Harding Memory.
Harry Hawn Merwin.
Kenneth Renwick Millspaugh.
Arthur Montgomery Morgan.
Edwin Kelley Mosier.
Waldemar Gardner Nichols.
Robert Maxwell Oram.
Raymond Palmer Pennoyer.
George Guthrie Potterton.
Robert Henry Röesen.
Walter Conrad Russ.
Elias Schlank.
Henry Fred Schorling.
Nils Ture Sellman.
Ernest Frederick Sickenberger, Jr.
Samuel Joseph Silbert.
John David Lloyd Smith.
Carleton Kenedon Steins.
Jerome Strauss.
Charles Sydney Trewin.
John Tucker, Jr.
John Henry Vander Veer.
Carleton Wandel.
German Julius Frank Weber.
Theodore William Weigele.
Robert Lyon Wellman.
Edward Van Dyke Wetmore.
Ralph Hamilton Williams.
Nelson August Zeiger.

In the afternoon the large Commencement crowd witnessed a fine baseball game between Rutgers and Stevens, which was won by the Red and Gray by a score of 4 to 2.

In the late afternoon President and Mrs. Humphreys held their reception to alumni and undergraduates in the Castle. The concluding event of Commencement week, the reception of the juniors to the graduating class, was held at the Castle in the evening. Some sixty couples danced until the rising sun announced the festivities of Commencement week a matter of history.

The Commencement committees were as follows:

Faculty committee—Albert F. Ganz, Charles F. Kroeh, Franklin DeR. Furman, Frank L. Sevenoak, Frederick L. Pryor, Alexander C. Humphreys, *ex-officio*.

Senior Class—Jerome Strauss, Kenneth H. Bedell, Peter R. Aronson, Edwin K. Mosier, Ralph K. Bonnell, G. J. F. Weber, Frank S. Darke, Robert M. Oram.

Ushers from the Junior Class—Harold J. Bogert, Henry H. Bruns, Harry E. Cawley, Arthur L. Collins, Frederick U. Conrad, Harold R. Gibbons, Clifton E. MacNabb, Leon L. Munier, Wilbur F. Osler, Jr., John B. Schofield, Lawrence T. Van Vechten and Carl J. Willenborg.

B. Franklin Hart, Jr., '87
Grand Marshall of Alumni Day Parade

Class of 1911, Winner of First Prize

ALUMNI DAY

OLD JUPITER Pluvius, who received his degree of Moisture Exuder from Mt. Olympus long before Stevens was thought of, joined in the activities of Alumni Day, on Saturday, June 7, and made his presence pretty well known for a newcomer. In other words, it rained, but the shower failed to dampen the enthusiasm of the throng of alumni and their guests back for a day at the Old Mill, although it did curtail the outdoor part of the afterncon celebration rather abruptly.

In general the scheme of Alumni Day this year was similar to that of the last few celebrations. A parade in the early afternoon, reviewed by Dr. Humphreys on Castle Point Field, a ball game afterward, and dinner and a concert at the Castle in the evening formed the full program of the day's activities.

The alumni classes, a rather smaller proportion than usual in fancy dress, gathered about the college buildings at 2 o'clock, and some little while later the parade was formed as the classes fell into line, in order of their graduation, led by B. Franklin Hart, Jr., '90, as grand marshall, on his big black horse.

As the parade entered the field by the 1897 gateway, the line halted, and President Humphreys was escorted to his reviewing point in the centre of the east grandstand. At this time both stands were filled to capacity, and there was a fringe of motor cars surrounding the field. The spectators had been kept interested during the interval of waiting for the alumni in watching the growth of a small, black cloud that was coming out of the west.

With the capped and gowned seniors in the van, and E. H. Peabody, '90, president of the Alumni Association, at the head of the body of alumni, the parade wound its way about the athletic track.

First came the Old Guard, including the classes as late as 1883. Following came delegations from the classes in order of graduation, each with arm bands, pennants or hat bands to designate its members and lend a dash of color to the scene.

The Class of 1890, which strode along with Henry Torrance, Jr., and a 1910 First Prize banner at its head, was the first to attempt something distinctive. This class held a "prize contest" for the benefit of the Alumni Association, and had in line an automobile purporting to be the goal. As the contest eventuated, it was won by E. E. Hinkle, '90, chairman of the Alumni Day Committee.

Ninety-three, celebrating its twentieth birthday, was the next class to make a special showing. The members lolled along in open carriages, looking the picture of affluence and content. Their vehicles bore many legends, the burden of them being that the class rode, not because its members were old, but because they were too wealthy to trod the common ground. A local paper asserted that they "wore no disguises," but truth will out—their beards were assumed for the afternoon.

Reunionites from 1894, 1895 and 1896 followed, wearing hat bands or arm bands inscribed with class numerals, and carrying pennants. The delegation from 1897 made a natty showing, in white ducks, blue coats and arm shields.

Ninety-eight imported an oriental flavor into the proceedings, with flowing white robes edged with blue, and won applause from the crowd for being the oldest class to costume.

The next class, 1899, put forth no special effort at gay dress, but 1900 made a fine showing in brilliant red sashes

emblazoned with class numerals, and red hat bands. They were followed by 1901, whose members presented a take-off on present millinery styles, and also wore large paper flowers in their buttonholes.

Red and gray hat bands marked the men of 1902, while 1903 formed a brilliant patch of color, wearing kimono-like garments that floated bravely in the breeze. No effort at elaborate dress was made by 1904, who followed.

One of the best effects of the day was presented by 1905, which typified the founding of *The Stute* in its senior year. The men were dressed in blue coats and white ducks, and each wore a hat formed like a duck. They carried canes which they interlocked during the march. Realism was added to the duck part of the costume, by including a real "squawk," in time to which they marched. As every Stevens man knows, *The Stute* was founded by Henry Van Riper Scheel, '05, and its mascot has been the duck.

Celebrating the latest innovation in the postal system, 1906 showed the workings of the Parcel Post. The men were clad in the regulation letter-carrier costume, and trundled pushcarts heaped high with bundles, or staggered along under the bulky articles sent through the post.

Nineteen seven was content with white flannels and arms bands, but 1908 came effectually disguised as waiters; to say they looked the part would perhaps be unkind, though a tribute to their powers of make-up. Once on the field, they still further carried out the allusion by chasing after several kegs that appeared to be heavy and full of something. Later in the afternoon the kegs seemed to be lighter, doubtless owing to evaporation.

The local press was once more led astray when 1909 marched by in dark business suits and wearing masks that a Hoboken paper said "resembled young English lads." It was mighty few seconds before the crowd in the stands caught the likeness, however, and President Humphreys

himself was much amused when he was confronted with nearly forty men who bore a family resemblance to him, to say the least. They dragged along a miniature gas-holder, labeled "Prexy's Gas," which tickled the fancy of the spectators.

Next came 1910, a husky bunch of civil engineers doing field duty. They were dressed to the part and carried all the paraphernalia.

Nineteen eleven made the biggest hit of the day. Boasting an attendance of fifty-seven out of seventy-five graduated, they typified the I. W. W.—"Institute Wonder Workers." They wore red shirts, and white trousers and hats, and carried banners that convulsed the grandstand throng. "To H—l with the income tax, where's the income?" demanded one sign. "We will all get a raise if the minimum wage law goes into effect," confidently predicted another.

"Just Kids," a comedy in one act, was played to crowded grandstands by the "baby graduates" of 1912, who wore Buster Brown costumes, dragged along express wagons and toys, and showed their juvenile ways generally.

The parade circled the track just once, passing in review before Dr. Humphreys and the judges in the east stand. The program then called for a few minutes of interclass visiting and "stunts," after which the baseball game between Stevens and New York University was to be held on the field.

Hardly had the judges begun their deliberations over the prize-winners when the people in the stands concluded their deliberations concerning the weather, for that little black cloud in the west had spread and spread and spread. First by scores, then by hundreds the spectators hustled for the most available shelter. Some got to the Castle, others as far as the main Institute building, but most were glad enough to rush pell-mell into the Morton Laboratory or other nearby roofed structure. Hardly had the exodus

A Group of 1909's Representatives

Class of 1912

started when the drops came, then a torrent of rain that continued steadily until about 5 o'clock.

From the sanctuary of the Morton Laboratory, President Humphreys announced the conclusions of the judges. For their combined excellent appearance and high attendance, 1911 was given first place. The twentieth-year class, 1893, was awarded second honors, and 1905 given honorable mention. The judges created a special honor, second honorable mention, and bestowed it upon 1909.

Just before sundown, the skies cleared, and the band gave a concert on the piazza of the Castle. Dinner was then served to some 600 diners in the Castle, and in the evening there was a band concert, an illumination of the grounds and dancing in the Castle.

There was one unfortunate occurrance that cast a damper on the gaiety of those who knew of it. Just before the parade of alumni entered the gate at the north end of the field, the drum-major of Matt's Twenty-second Regiment Band, John F. McGrann, who was at the head of the musicians, suffered an attack of heart failure and died almost instantly.

The general committee in charge of Alumni Day consisted of E. E. Hinkle, '90, *chairman;* Samuel H. Lott, '03, *secretary;* Charles B. Grady, '97, *treasurer;* F. C. Fraentzel, '83; F. W. Cohen, '92; J. W. Gilmore, '94; David C. Johnson, '06; C. G. Michalis, '07; C. F. Cunningham, '10, and E. H. Peabody, '90, *ex officio.*

The reception committee caring for the invited guests comprised John W. Lieb, Jr., '80; R. S. Kursheedt, '80; J. H. Cuntz, '87; E. H. Peabody, '90; Prof. F. DeR. Furman, '93; Prof. Albert F. Ganz, '95; Walter Kidde, '97; R. C. Post, '98, and Harlan A. Pratt, '04.

BISHOP LINES PREACHES BACCALAUREATE SERMON

THE Commencement sermon was preached by the Rt. Rev. Edwin S. Lines, D.D., Bishop of Newark, in Trinity Church, Hoboken, on Sunday morning, June 8 from the text "It is required in stewardship that a man be found faithful," I Cor. IV: 2.

In the first part of the sermon, the thought of Stewardship, with the sense of responsibility for the right use of all possessions, of training and education, of opportunities, was presented as the true and only satisfactory working theory in life. Bishop Lines spoke in part as follows:

This theory of stewardship and responsibility fits into every life and every condition. It is a merciful thing about the divine ordering of life, that a man's responsibility is measured by the possessions and opportunities given him, and the man of one talent stands as well before God as the man of ten talents if only he uses well what he has. We have all learned, that the man called to his work at the eleventh hour, after having waited long in the market place because no man had hired him, has in that consecrated hour at the end of the day met his personal responsibility in the noblest way. There are compensations and adjustments in this complicated business of life for those who have a high purpose, which impress one more and more with the merciful ordering of human life. We need to change a good many of our judgments as to what makes success or failure in life; but given a high purpose, there seem to be influences to make adaptations which are altogether merciful.

The thought of looking upon all we have as borrowed and given into our hands as stewards, carries with it the thought of the misuse of God's gifts. What any man would expect and require of another placed in a position of responsibility, that he ought to require of himself. The maintenance in the University and Institute among the students themselves of high ideals as regards character and intellectual attainments passes, in importance quite beyond discipline, and lectures and recitations. The greatness of the University depends more than any other one thing, upon the instruction, the ability to teach, and beyond that to inspire a love of learning, but there is a public sentiment which college men make which gives the University its place in the regard of the nation. The reputation of the institution of learning is largely in the hands of its students and graduates and a sense of responsibility such as I am pleading for, makes rich and great the contribution of the University to the National life. The sending out of men equipped to develop the great material interests and resources of the country yields to the importance of sending out men trained and disciplined to feel a high sense of responsibility for the use of their own lives for the common good. I think that a college man ought to determine, as part of his responsibility, that every word or act of his should help those about him to nobler and stronger lives, and that there should never be man or woman in the world who could say that his word, or act, or companionship had ever injured or degraded him or her in any way. There is no possession in life like a good conscience and the ability to face any man or woman with the feeling that there is nothing in one's conduct to be found out and nothing to be regretted. That is a standard of personal responsibility which can be maintained, and it will bring a man peace at the last.

There will come times in every man's life when the temptation to be less than true to one's self seems irresistible;

when the powers of evil seem determined to break a man down. The slight departure from what a man knows to be the right course promises great advantage. A man is swept on by passion and some excuse for yielding readily suggests itself. In the struggle of conflicting interests a man loses his reckoning. There are plenty of teachers to tell men, that it is natural for them to do what their consciences disapprove, that the larger world into which they have come may have other standards than those of the old home. Then a man must rouse all his moral strength and keep the citadel of his heart in purity and integrity. He must keep the sense of responsibility strong, remembering, that there is nothing comparable to a character above reproach. Strength must be found to fight out that battle by Communion with God. But with the strength given him from above in answer to his prayers, he may win in that struggle for self-respect and he will stand on a higher plane of manhood, able to face his enemies with new courage, for he has saved that of which God made him a steward, and he has saved himself.

There is one word in our text which claims special attention, and a word full of blessing it is. "It is required in stewardship that a man be found faithful." It is a different test from that which we commonly apply to the lives of men. We are disposed to demand success. We call the outcome of life a failure or of small account unless some form of visible success attend it. The very atmosphere which we breathe cultivates that thought about life. The magazines which men read instead of substantial books, are filled with accounts of men who are winning attention and applause by doing something which is called remarkable. One who tries to remember the lessons out of the past and judge human life fairly, one who has watched men win great success by shrewdness and cunning to be soon forgotten, wearies of the pictures of men and women who are

said to be in the public eye. The demands of the time seem to be met by those who play to the gallery, and the great company of quiet and faithful workers who are really contributing most to the world's better life are overlooked.

In the standard of judgment declared in the requirement of faithfulness, we have the correction of this superficial test of men. A great company of men and women who have never won much that the world counts success have stood the test of faithfulness. Quietly, out of sight, they have set themselves to the task which lay just at hand, doing their duty without looking for applause or encouragement which comes beyond that from a good conscience. Men and women have turned away from the opportunity of making great careers or winning fortunes and high places, that they might be absolutely true and that they might do their duty to those dependent upon them. They have met the divine requirement in respect to stewardship, and if there be truth in our religion they have made the right choice.

Faithfulness means that a man meet his responsibility, do his duty where God puts him, using his life and all that pertains thereto for the highest and noblest ends, although, it may mean turning away from what are commonly called the greatest advantages. It means that a man is able to see things as they are and to see life whole, to see things which are spiritually discerned and are Eternal. That is the vision which has opened before the men and the women who have done the world's best work, and it is a vision open to all who will receive it. Woe is to the man who is disobedient to the heavenly vision, no matter what comes to him in place of it.

There was a Scotch Missionary, Burns, who died in China a few years ago, after a life of peculiar devotion in his work. After his death his friends gathered his few possessions together, finding little more than the Chinese dress in which he had gone on his missionary journeys and a few books,

and sent them home. A young girl standing by when the box was opened said: "He must have been a very poor man!" That is the world's judgment upon many of its noblest servants, like his Master, being poor he had made many rich. Doubtless he was helping to bring in that Revolution, which as we hope, sets the greatest of Oriental Nations forward in the way of happiness and truth. There are few words in the New Testament, rightly understood, which bring more of help and hope to a great company of men and women trying to do their duty than this and faithfulness. You say, that not all men may win success even in a moderate degree, although they work hard and seem to deserve it. Some will fall out of the race of life early, the recall sounded when they are hardly on the way, but a short life may have added to the world's stock of goodness and be a continuing influence and inspiration. A young man who had stood seventh in a class of more than three hundred in one of the great colleges, and first in his class in the Divinity School, gave himself to Mission work in China; within a year or two losing his life in an heroic effort to save his classmate and fellow missionary from drowning. His body rests in far away China, but his life is an inspiration and help to many who knew him, and will be for more than a generation. Upon the Palisades we have built for him a Memorial Chapel, and we have written at the door: "Greater love hath no man than this, that a man lay down his life for his friend." I am sure that out of the reading and experience of most of us there come examples of faithfulness and devotion to enforce what I am trying to say. "They that are faithful over few things shall be made rulers over many things and enter into the joy of their Lord."

Rightminded men will put faithfulness before success as an aim in their own lives and in their judgment of other lives. The life marked by faithfulness cannot be a failure;

it has filled out the divine purpose and God will care for its influence.

My message to you then today is, that in the thought of stewardship you will find the key to the understanding of life, a good working theory, and that the test of stewardship is not success but faithfulness. There seems to be coming a new spirit into the world which expresses this thought. More and more men seem to be feeling the sense of responsibility for the use of their powers and their means for the common good. More and more men are trying to extend the advantages of life and to give as many as possible a chance. The selfishness of men in public life in their use of their places for personal gain rather than for the common good has offended us, and there are younger men appearing with higher ideals and the public conscience is aroused to fight for better things. Through some foundations for research and study, it may be that the weapons are in preparation which will make an end of many municipal abuses and direct many well met efforts. Social service is taking an accepted place in every church and in every community. The display of luxury is accepted as a sign of low ideals if not vulgarity. Many men of large means are ashamed to live selfishly. Men of the greatest learning and professional skill are giving their service to those in the greatest need. The compelling motive back of all missionary work is the thought of sharing our gifts with those who have them not. So the thought of stewardship is winning its way in the world, the inspiration of many movements for the good of men. Be sure, that the hope of making out the noblest kind of life for yourself is the acceptance of this thought of stewardship.

As one who has travelled far on the road upon which you enter this week—the road through life from college—let me plead with you to go on with the sense of stewardship for all that you have in the way of training and knowledge,

and of personal responsibility for their noble use. If you set material success before you as the only end in life you will make a great mistake. If you only think of getting before somebody else in position and power you will not live a large life. The world is getting sight of something above competition and the strife for selfish success, even brotherhood and the common good. Every educated man is bound to take out into life regard for the common good, the spirit of helpfulness, high ideals as to the use of his life.

It was Dr. Pritchett of the Massachusetts Institute of Technology who said, "no man can hope to be an engineer in the greatest sense who has not some actual contact day by day and week by week with his fellow men." "Whether you are to deal with electricity or Chemistry or mechanics, you are to deal first of all, all your life long, with men." "If we are ever in this country to work out the problem or right relations between employers and laborers, you men who are engineers must help to that solution. You stand between capital and labor; you give a hand to each. You ought to be able, if you are educated, broad-minded, sympathetic men, to understand that each of the parties in this dispute has rights which the other ought to respect, and that both have obligations to the public which they must in the end recognize and respond to; but they will be brought to recognize their mutual obligations and relations all the quicker if you men who are engineers can bring to the study of such problems an open mind, a judicial spirit and a sympathetic appreciation of the difficulties of each."

"If your scientific studies furnish you no suggestions as to your relations with other men, if they do not connect themselves with the philosophy of life and of conduct, if they do not strengthen your moral purpose and help to clear your conception of truth and of duty and quicken your sympathies with other men, then you have got only the husks of an education."

Some of you will move on quietly, steadily towards success, as the due reward of hard work, patience and skill. There is no success worth making account of which is not based on high character. As success and higher place come, larger responsibility will come to the right minded man. Some of you will have to face hard struggles, disappointments, hopes deferred, the fear of failure. It may be possible by courage and a supreme effort at a critical time to snatch success out of apparent failure. You may have to see what you have built up by patient work go down in ruin about you and all seem lost. But if you, as a man of high character, working as in the sight of the great Master, can fall back on the truth that faithfulness, the endeavor to do your best, not success, is the true test of a man's life, you will come through all hard experiences and make out the best kind of a life.

COMMENCEMENT ADDRESSES

Address by President Humphreys

ON BEHALF of the Trustees and Faculty I extend to all here present, and particularly to those directly interested in the members of the Class of 1913, a hearty welcome to this our forty-first Commencement.

I leave it to the representative of the graduating class to extend this welcome on behalf of his class.

I will ask your indulgence for a few minutes while I speak of the affairs of Stevens, and especially with regard to the school year now ending.

Last year our entering class numbered 101 as compared with 110 the year before, and as compared with 131 for the year 1910. Our total enrollment this year, just before the second term examinations, was 309 as compared with 343 in 1912, and as compared with 360 in 1911.

The decrease in our enrollment is, no doubt, due to the increase in our regular tuition rate from $150 to $225. This increase already applies to the Freshman and Sophomore classes and in two years more will apply to all classes. I should welcome such an addition to our productive endowment as would enable us either to restore the former lower rate of charge or to provide free scholarships for those who cannot afford to pay and can give such evidence of ability and character as to warrant such assistance *without the fear on our part that we might be helping those not worthy or not qualified to profit by the help thus extended.*

The Class of 1913, which graduates today, began its life with us with an enrollment of 142. Today they number

65, about 40 per cent only of the entering members, and of these a few joined the class after the freshman year. The names of a few of those who graduate do not appear on the program because when the program went to press some work had yet to be completed by the men thus omitted. A few who have been members of the class during the Senior year are not graduating today, but we hope that they will be able to complete the work and graduate in September, or graduate next year with the Class of 1914.

I deeply sympathize with those who are thus held back from participating with their classmates in the joys of today; but it would be a false sympathy which would give them credit for that which they have not earned. This failure is not always due to neglect of opportunity, but sometimes is due to circumstances over which the student has not been able to exercise control.

During the year we have not been called upon to meet any serious questions in connection with discipline. I congratulate the men who graduate today upon their part in this satisfactory condition and particularly I congratulate the chosen representatives of the class who have cooperated during the past school year in further developing the scheme of student self-government. By this scheme the students are encouraged to so govern themselves that the necessity for Faculty control will be reduced to a minimum. It is understood, however, that where and when the students do not exercise the necessary *self*-control, they will receive the full and prompt assistance of the Faculty.

At Stevens, students and Faculty take pride in the fact that hazing and cheating are taboo, and that clean athletics are more to be desired than victories in the field. Personally, I feel that there is room for improvement in these matters in many of the colleges of the United States. As

long as no names are mentioned, perhaps I am not transgressing in making this statement.

During the year we received gifts amounting in round numbers to $51,000. About $9,790 of this was subscribed by the alumni, including $5,350 subscribed to the Graduates Fund towards current expenses. Mrs. Henry Lang subscribed $10,000 for the fund for the purchase of the Robert L. Stevens land, and the late Stephen S. Palmer of the Board of Trustees, subscribed $25,000 to the same fund. Including a number of smaller contributions, this fund now amounts to $37,880 with about $30,000 additional subscribed by the alumni, to be paid in installments. There is required to pay for this land and another piece included in our scheme for expansion, about $200,000.

The operating expenses for the past year exceeded the revenue by $37,189. After absorbing this loss—but not paying it—the increase in our capital was $15,197. But this increase in fixed assets does not help to pay our running expenses.

During the last six years, including the $37,189 just named, the running expenses have exceeded the income almost exactly $150,000. Answering an enquiry recently addressed to me as to how we have paid this deficit, I reply, "We have not paid it. We are in debt $150,000 for the accumulated deficit and about $200,000 on the Castle Point properties already purchased, or say $350,000 in all." It will be seen that if we can get relieved from this burden of debt we shall be relieved of interest charges which make nearly one half of our present annual operating deficit. Another burden is that of taxes, which Stevens, contrary to the freedom enjoyed by most educational institutions in the United States, has to carry. We paid in taxes this last year about $4,500.

In this connection I may mention that we have not yet recovered from the United States government the $45,750

so unjustly taken from our original endowment forty years ago; and this notwithstanding our constant and persistent efforts to bring the authorities to a correct view of their responsibilities. I say "unjustly" taken, because the act repealing the war income tax measure under which the tax was levied relieved all the educational institutions which had *not* paid their assessments levied years before our assessment, while making no provision to return to Stevens the amount paid into the United States Treasury *within thirty days of the receipt of the bill.* This seems to be a contradiction of the statement that "Honesty is the Best Policy." Perhaps we may hope that the new administration, presided over by a college president, may be inclined to break this record of injustice, not to say dishonesty.

Particularly I wish to put on record the gifts of $750 each from the Classes of 1902 and 1912, to be applied to the construction of a dining-room in the basement of the Castle for reunions and dinners of the several graduate classes. Also the gift of $300 from the class of 1903 in commemoration of the tenth anniversary of their graduation—the first class to graduate under my presidency. Also the gift from this Class of 1913 to be applied $812.50 to the fund for a gymnasium and $2.50 each to be applied to Alumni Association dues. This class also gave the surplus from publication of *The Link*, $290.

The Class of 1887 has just announced a gift of $325 to furnish Study room, third floor, Castle; and in connection with this gymnasium fund let me say that we are in great need of that addition to our plant. Recently the Stevens Y. M. C. A. started this fund with a subscription of $50. The subscribers felt very modest because of the smallness of the amount. I have told them that this $50 represented the right spirit in giving for it was for the benefit of those coming after them, not for personal benefit, and it represented self-denial. Let us hope that some person, who

has been a gymnasium enthusiast, well endowed with this world's goods, and recognizing the great good to be derived from such an annex, if properly governed, may be found willing to add materially to this fund.

Castle Stevens is fulfilling our hopes in contributing what was much needed to the life of the students outside of the roster hours. It has also, during the year, been the meeting place for the alumni on many pleasant occasions. Its operation adds to our deficit and will continue to do so until we have a dormitory to be operated in connection with the Castle, thus spreading the general or administrative charges over a greater number of students. Last Saturday evening—Alumni Reunion Day—the building and grounds were crowded with alumni and friends and notwithstanding the storm of the afternoon over 700 dined in the Castle and on the lawn.

The athletic field has continued to be a most satisfactory source of recreation and relaxation to the students of the Institute and also of the Stevens School. While we have not won many victories, we have had at our very doors a field second to none, so giving our students, hard worked as they are, the best opportunities to avail themselves of all the time left in their hands.

I have been unceasing in my efforts during the year to lift the burden of debt resting upon us and so obtain the money required for necessary extensions and improvements I have been in sight of success a number of times, only to meet again disappointment. I can only go on trying to meet my responsibilities and hoping that at least those who have promised will not continue to fail us as has been the record this year in a number of cases.

Since last Commencement we have lost not a few from our ranks:

Stephen S. Palmer, Trustee and generous benefactor and wise counselor of the Institute, died January 30, 1913.

"Old Guard" Leading the Line

The Seniors in Cap and Gown

One of 1893's Carriages Passing the Grandstand

Head of the Line Approaching Reviewing Stand

John Fritz, recipient of the honorary degree of Doctor of Science from Stevens in 1907, died February 13, 1913.

Ralph P. Badeau, '09, died July 20, 1912.

J. H. Fulton, '05, died August 19, 1912.

Edward L. Jones, '92, died October 18, 1912.

Maunsel White, '79, died October 22, 1912.

Chester E. Bradley, '03, died October 29, 1912.

Frank A. Magee, '83, died January 2, 1913.

Samuel T. Mudge, '06, died September 8, 1912.

Oscar Antz, '78, died January 9, 1913.

F. B. Crosby, '09, died April 20, 1913.

Men of the Class of 1913:

Having thus spoken of the affairs of the Institute in general, it remains for me to say the last words which I shall address to you as undergraduates. I hope sincerely it will be my good fortune to meet you often as fellow alumni. As graduates you will appreciate even better than you do now what your Alma Mater has done for you and which is consummated today. The alumni of Stevens are justly noted for their loyalty and self-sacrificing devotion to their Alma Mater. There are always exceptions to every rule, and of course, there are some graduates who are indifferent or worse to the claims of Stevens upon their respect and love. These men are either the victims of a misunderstanding, the victims of a petty spite against some professor or official, or are confirmed opponents of government, whatever that may be. I trust that the Class of 1913 will be free from this unlovely and unreasonable element.

Bear in mind that nothing is perfect in this world. What we have done for you has not been perfect. But we have given you the opportunities in full measure to secure an efficient, sane, preparation for the *perfecting of yourselves* in some one branch, at least, of the engineering profession.

Remember that it remains for each of you to learn through

practice in the school of experience that which no school or college can give you. It is for you to see to it, however, that you learn in this other school more completely and more promptly because of your Stevens training.

Remember that above all formal learning stands character. While we have tried to help you in that regard also, the final test is up to each of you.

Do your work well and completely. How trite it sounds to you, but how much it means, as you must realize later.

Do not be in haste to worry about your profession. Learn thoroughly the work and duties assigned to you before you look for something higher.

Do not let it be three, or two years, or even one year before you learn that the teaching of the college is only part of what you require for real success. How many men have told me, some of them Stevens graduates, that it took three years of hard knocks after graduation to convince them that the college diploma did not give them a monopoly of anything.

On the other hand, you have received, have won for yourselves during the years spent here, something of inestimable value, something which young men all over this great country are praying for the opportunities to win. Then it is for you to recognize that opportunity, privilege, and particularly *specific education* carry with them definite responsibility.

If through your particular training you are qualified to render specific service to humanity or the State, you must be prepared to accept and respond to that responsibility. This is especially pertinent at this time because the country, yes, the world, is troubled by a spirit of unrest, which, if not wisely guided, means disaster, and particularly so to those who are prominent in the movements for change—or reform, as they say.

Remember that reform cannot be obtained as the result

of good intentions alone. Good intentions are worthy of our respect, but you know that a man is not able to carry through some great engineering project because his intentions are good in that regard. And there are many problems now being discussed, the solutions of which are being attempted with easy confidence by men and women whose only qualification for the work is that of good intentions. *And many of these problems are far more difficult of solution than any engineering project.* The latter can be solved if the right men and the money can be found. Some of these other problems never can be solved *completely* this side of the millenium.

But go out from Stevens resolved to do your full share towards the solution of all the problems presented in which you feel your training qualifies you to assist. Also be careful *not* to take too prominent a part in any movement until you understand where it is intended to lead. Beware of the professional reformer and investigator, who is ready to reform anything and everything except himself and the things in which he is interested. Be always on the side of true reform, but do not spell reform with a capital R and do not use your activities in this regard as do many of the magazine writers and politicians. In other words, try to be an *unselfish* worker for the betterment of the conditions around you and, therefore, begin with those immediately under your influence and control.

To go out into the world and secure well-earned credit for yourselves and so bring credit to your Alma Mater— This is my earnest prayer in your behalf.

In selecting class speakers for Commencement, while we recognize that scholarship should be an important factor, we consider that other qualifications should count.

The ten members of the class ranking highest in scholar-

ship are invited to compete, the Commencement committee and the administrative officers acting as judges.

The ten so selected this year and their standing as to scholarship are recorded here and here announced as Honor men.

	Scholarship average
P. R. Aronson,	89.8
W. H. Merwin,	83.2
K. R. Millspaugh,	83.8
J. Strauss,	93.7
C. S. Trewin,	81.8
R. L. Wellman,	81.5
H. S. Hunt,	81.2
W. L. Iliff,	79.7
R. N. Cram,	81.4
J. H. Vander Veer,	81.3

P. R. Aronson was selected as Salutatorian and J. Strauss as Valedictorian. As it happens the successful competitor for first place, valedictorian, was the man with the highest standing in scholarship.

SALUTATORY ADDRESS BY PETER RUDOLF ARONSON

Mr. President, Gentlemen of the Board of Trustees, Members of the Faculty, and Friends:

The class of 1913 bids you a hearty welcome to these exercises. Four years ago we started on a straight and narrow road where progress requires hard study and constant application. For four busy years we have moved along as a band of brothers stretching out a helping hand to one another; here and there losing one who needed a breathing spell; and occasionally overtaking a wayfarer who, refreshed by a short rest, was able to take up his journey in our company. At length we have reached a point where we see this narrow road spread out into a wide highway that cuts with many branches through the broad fields of engineering.

Public opinion is ever changing. It is not very long ago that the public's lack of confidence in engineers thwarted their best efforts. How people ridiculed Watt and shook their heads in doubt even after he had demonstrated that his steam engine would run! What tedious delay disheartened Bell before he could convince the world of the value of his telephone! What incredulous smiles met George Westinghouse when he sought someone with faith enough in his air brake to finance its production! The progress of engineering science, however, is no longer hindered so seriously by doubt and mistrust. The world today is awake. It understands the important part that the engineer plays in human progress. It perceives that the great achievements of engineers represents man's conquest of the powerful and elusive forces of nature; and that progress in engineering, a very evident result of intellectual development, measures the advance of a nation's civilization. The engineer's boldness in planning, his ingenuity in overcoming, and his perseverance (frequently baffled but never overcome), in such undertakings as the laying of the trans-Atlantic cable and the building of the Panama Canal have won the admiration and respect of the world for his calling.

We have been trained for this noble profession and must do our utmost to give it a place even higher than that which has at length been accorded it among the learned professions. We have received a general engineering education. Now we shall choose that particular field into which our inclinations lead us. Some of us have a liking for the electrical; some prefer the strictly mechanical; some will find their way into the gas field; some will join the railroads; others will go into mining, or structural engineering, or manufacturing, or take up patent law. Thus we shall separate, and yet we shall be united, for the bounding lines of the fields are not distinct, and our fundamental

theories underly all fields alike. We shall meet with reverses and discouragements. In each line of work we must start at the bottom and climb. We must be satisfied with what we may consider thankless remuneration for our labors. We shall be told by practical men that we know nothing. Often we shall be forced to live and work in environments which are anything but pleasant. Jealousies will confront us; favoritism will be shown. But these things must be endured, for opportunities will come with them and earnest and faithful work will reap the rich reward which we feel certain you desire to see us secure.

In awarding the prizes and scholarships Dr. Humphreys said:

Hudson County Schools Scholarships—Three scholarships each year—making twelve in all—are given each year to graduates of the Hudson County High Schools, preferably the Hoboken High School. If in any year these scholarships are not filled from the Hoboken High School, the vacancies may be filled from graduates of other Public High Schools of Hudson County. The names of the successful competitors each year cannot be announced until after the September entrance examinations.

Last September the successful competitors were: Willis H. Taylor, graduate of the Hoboken High School; Arthur B. Belloff, graduate of the Hoboken High School; Arthur D. Soper, graduate of the Jersey City High School.

Hoboken Academy Scholarships—One scholarship each year—making four in all—is given to a graduate of the Hoboken Academy. Last year this scholarship was not awarded.

Stevens School Scholarships—One scholarship each year—making four in all—is awarded to a member of the Stevens School, Senior class, who, having been a member of the School for at least two years, passes the best examinations

for admission to the Institute. Last year the scholarship was divided and one half was given to H. J. C. Baack, and the other half to John A. Conlogue, Jr.

The Priestley Prize—was founded in 1877 by President Henry Morton, Dr. Albert R. Leeds, Mrs. M. B. Stevens, Mr. S. B. Dod, and Mr. W. W. Shippen. Formerly it was awarded to the member of the Junior class who had most distinguished himself in the department of chemistry during the Sophomore and Junior years. This has now been changed to include also the work of the Freshman year. The prize is $25. This year it is awarded to Paul Lupke, Jr., average 95.1.

Honorable mention is awarded to Lloyd F. Bayer, average 92.8, and Arthur E. Stover, average 91.1. Six others I am tempted to mention, the lowest of the six having an average of 85.3.

William A. Macy Prize—Originally this prize could be awarded only to a member of the Freshman class who had entered from the Hoboken High School. This admitted of but little competition. By several amendments the prize was increased from $10 to $20, and is now awarded to a member of the Sophomore class on the record of the work of the two years; and graduates from the Hoboken High School, the Hoboken Academy and the Stevens School are now eligible. The prize this year is awarded to Henry M. Beekman, average 90.8, a graduate of the Stevens School. Honorable mention is awarded to Myrtus Ashton Davis, average 87.1, a graduate of the Hoboken High School.

Mary Starr Stillman Prize in Applied Technology—This prize, $50 in gold, was established by Dr. Thomas B. Stillman, late head of our department of chemistry, in memory of his mother.

It is open to competition by members of the Senior class, and is awarded to the writer of the best paper on a subject pertaining to applied technology. The prize was awarded

for the first time in 1910. The subject this year was, "*The Advantages of Applications of the Low Pressure Steam Turbine*," and the prize is awarded to Jerome Strauss.

The essays by Peter Rudolph Aronson and Elias Schlank are well worthy of commendation.

The Cyrus J. Lawrence Prizes—Two prizes known as the Cyrus J. Lawrence prizes have been founded by an alumnus of the Institute in grateful remembrance of his benefactor, the late Cyrus J. Lawrence, whose financial assistance helped him to take the full course at Stevens Institute.

Beginning with the Class of 1910, these prizes are awarded annually to those members of the Senior class adjudged first and second, respectively, in influence in promoting student activities, in fostering a spirit of coöperation between the Faculty and the student body, and in general in contributing to the elevation of the ideals of student life, provided the said two members have maintained a satisfactory rank in scholarship. The first prize to be $50 or its equivalent, and the second prize $25 or its equivalent.

The awarding of these prizes presented many difficulties. No better plan having been found than the one tried in the past, it was again employed this year. The records of all members of the class as to legitimate activities were analyzed, with the result that of those showing satisfactory scholarship, the following ten man were found to be in the lead:

	Scholarship average
P. R. Aronson,	89.8
T. P. Bradshaw,	75.4
W. M. Kelley,	76.3
T. J. McLoughlin, Jr.,	74.4
J. Strauss,	93.7
C. S. Trewin,	81.8
J. H. VanderVeer,	81.3
R. L. Wellman,	81.5
R. H. Williams	77.3
N. A. Zeiger,	70.7

The names of these ten men were presented to the members of the class and they were requested to express their preference without previous conference, by sealed ballot under the conditions prescribed. As all the men whose names were so considered established records highly honorable along the lines specified, it gives me pleasure to give them due credit as this time.

Guided by this vote the Faculty Committee awarded the first prize to John Henry Vander Veer, the president of the Senior Class, and the second prize to Nelson August Zeiger.

Dr. Humphreys then spoke of the men mentioned by class president on Class Day as having worked honorably and zealously for the Class and the Institute, Robert H. Lansdell and Nichol H. Memory, the latter is permanent class president.

Address by Dr. W. W. Finley

Mr. President, Ladies and Gentlemen:

It was with full appreciation of the honor of delivering the Commencement Address at this Institute that I accepted the invitation extended to me by Dr. Humphreys.

I shall endeavor to say something that I hope may be of practical benefit to the members of the graduating class. As young men about to enter upon your life careers, you are looking forward with high hopes to the future and are interested in the opportunities it may hold in store. Bearing in mind the extent to which public policies may affect the development of the United States, I have chosen as my subject, "Government and Opportunity."

The Constitution of the United States may be said to have marked the culmination and fruition of centuries of struggle by the Anglo-Saxon peoples to obtain for the individual the maximum degree of liberty of action, either by himself or

in association with others, and to reduce to a minimum governmental restrictions upon his activities.

The first century of our life under that Constitution was one in which relatively scant use was made of the regulative powers which it conferred upon the Federal Government, and the State Governments were generally conservative in the exercise of their reserved powers. It was a century of phenomenal achievement in which, to an increasing extent, enterprises beyond the capacity of an individual or a small group of individuals were undertaken. This led to the development of the corporate system under which relatively small capitals of many individuals are brought together under a single management.

It was inevitable that governmental policies fitted to a people mainly engaged in agriculture and in whose life the business corporation was a small factor, should require some modification to fit them to the changed conditions brought about by the growth of manufacturing, the increased importance of transportation and the development of the corporation.

The American people have set about making this readjustment and we are now passing through the transition period. The situation is one calling for the exercise of the highest political wisdom in order that such control as may be necessary to prevent abuse, may be exercised without shutting the door to opportunity and retarding our progress as a people.

We are living in the day of great enterprises. The factory under corporate management, with its intricate machinery and thousands of operatives, has taken the place of the small workshop, with its individual owner, small group of journeymen and apprentices, and hand labor; and the railway has supplanted the carter. A return to former conditions would be as impossible as it would be undesirable. The corporation must have a permanent place in our industrial life

and the opportunities of the future for the graduates of such institutions as the Stevens Institute of Technology must be found very largely within its organization.

For this reason it is a matter of vital importance to the rising generation and especially to the graduates of this school that the problems of governmental regulation of business corporations shall be wisely and conservatively solved. This is not only to your interest, but it is to the interest of all the people, for the activities of man are so closely inter-related and inter-dependent that any policy tending to the injury of any important industry or occupation can not long be persisted in without harm to the entire body politic.

In his inaugural address on the fourth of last March, President Wilson said:

"Society must see to it that it does not itself crush, or weaken, or damage its own constituent parts. The first duty of law is to keep sound the society it serves."

There can, I think, be no question as to the soundness of the views expressed by the President in these two sentences. They may be said to summarize the philosophy of government, for the objects of all government should be the well-being of the State as a whole and the happiness and prosperity of the individuals who compose the body politic. The attainment of these objects may best be brought about by what may be termed conservative progressiveness. Intrinsically, conservation and progress are not antagonistic. On the contrary, wise conservation is essential to true progress, for it is as important that we shall hold fast to all that is good as that we shall accept changes that give promise of remedying what may be bad.

In fact, I believe we may well question whether there is not more danger that we may crush, or weaken, or damage the constituent parts of society by hasty and ill-considered changes in the name of progress than by clinging to time-

tried polices until we are thoroughly convinced that changes proposed will work real and lasting improvements. Lord Bacon, whose essays have been termed "a very orchard of the apples of wisdom," expressed this idea in the following language:

"It is good also not to try experiments in states, except the necessity be urgent, or the utility evident; and well to beware that it be the reformation that draweth on the change, and not the desire of change that pretendeth the reformation."

Bulwer, in connection with a reference to the deliberation that must attend the alteration of the Constitution of the United States, says:

"So, more or less, in every community where a considerable degree of political freedom is possessed by the people, experiments which seem to involve any hazards to the duration of liberties existing, though proffered as extensions and accelerants of their action, may be regarded by the most devoted friends of the people's freedom with the same disfavor with which the trustees for the enjoyers of a solid estate would listen to proposals to hazard punctual rents and solid acres for shares in a company which offers 20 per cent and the chances of bankruptcy."

In the same essay, Bulwer still further develops the idea that I would seek to impress when he says:

"There is nothing in a conservative policy antagonistic to progress. On the contrary, resistance to progress is destructive to conservatism. * * * A conservative policy * * * should have no fear of the calm extension of knowledge. Its real antagonist is in the passionate force of ignorance."

These two essayists—one of the time of Elizabeth, and the other of the time of Victoria—warn us against hurrying headlong into changes in the vague hope that they may be beneficial, or being led to the adoption of ill-considered

innovations which may be found to be supported by "the passionate force of ignorance." In a country such as ours, in which all legislative powers and all executive authority proceed from the people and in which the people can change the fundamental character of the government, it is of supreme importance that popular action shall at all times be controlled and guided by an intelligent public opinion which shall so shape governmental policies that they shall conserve the well-being of the body politic and its constituent members and insure their progress by preserving the widest possible range of opportunities.

It is inevitable that, in every country, there shall develop situations in which, considered superficially, it might seem that the interests of some would be advanced by governmental restrictions upon the liberties of others and the temptation may be strong to attempt, in the name of progress to impose such restrictions. In so far as such restrictions may be necessary to prevent any individuals or associations of individuals from invading the liberties or rights of others they are consistent with sound principles of governmental policy. If, however, they tend to impose hardships or deny equality of rights to certain elements of our citizenship they are not truly progressive.

Real patriotic progressiveness is that which seeks to conserve and co-ordinate all of the useful forces of the country without the imposition of special restrictions or the conferring of special rights. It is the progressiveness that, instead of imposing undue restrictions upon agencies of production or distribution, would leave to them the maximum of liberty consistent with the welfare of the body politic as a whole. It is the progressiveness that would weigh carefully each proposition for a change, considering all of its ultimate, as well as its immediate, effects, and would not, even if everything seemed to be wrong, grasp at the first suggested remedy, just as excited and impressionable

people, in time of an epidemic of some dangerous disease, will follow every course of treatment that may be recommended to them.

So far as governmental policies do not deal with crimes, public order, matters of public health, or social relations, they have to do with business activities. In this latter relation they should have due regard for the laws of economics. It is important, therefore, that policies affecting the business activities of the people should be studied as economic problems. If we study them in their economic aspects I believe that we will find that those policies which allow the largest liberty in the conduct of business consistent with the protection of each individual from unjust treatment are most favorable to true progress.

On many previous occasions I have stated the application of this principle to the business of transportation by rail by expressing my opinion that such regulation of railways as may be necessary to prevent undue discrimination between individuals, localities, and commodities, and to prevent charges that are exorbitant or unreasonably high as measured by the service performed, is sound as a matter of economics and of governmental policy. I am equally of the opinion that regulations going farther and seeking to deny to a railway the right to fix for its service charges that are not unduly discriminatory and that are not exorbitant or unreasonably high as measured by the service performed are not based on sound principles of economics or of governmental policy. Their ultimate effect is to retard railway development and to impair the ability of the railways to provide the increased and improved facilities necessary for the prompt and satisfactory transportation of the commerce of the country. Such regulatory policies are, therefore, restrictive of opportunity, not only in railway employment, but in every productive and commercial occupation.

It needs no argument to demonstrate that regulations

which would tend to restrict agricultural production or to impose undue burdens upon the commerical interests of the country would be disadvantageous to all members of the body politic. It is equally true that undue restrictions upon transportation must react upon every individual whatever may be his occupation. It is the function of the transportation agencies of the United States to carry our citizens on their journeys over all parts of the country, to haul to market the products of farms, factories, forests, mines, and fisheries, and to carry the mails of all the people. Even though a man might not, in the course of a year, have a single direct business transaction with a transportation company he would still be vitally concerned in the efficient conduct of the transportation business. It is to his interest that conditions surrounding that business shall be such as to attract the investment of capital needed to provide ample facilities for carrying the commerce of the country, and that State and Federal governments shall recognize the economic obligation which they are under of abstaining from unduly restrictive regulation and of according just and equitable treatment to transportation companies, including such matters as the imposition of taxes and fixing compensation for the carriage of the mails.

It is difficult, even for men in the railway service, fully to appreciate the enormous volume of traffic that is carried in a single year or even in a single day on the lines of all the railways of the country. A single comparison may suggest faintly the extent of this public service. Every American is interested in the great work being done by our people in the construction of the Panama Canal at a cost of $375,000,000. It is in no way detracting from the importance of this great waterway to point out that, while according to the largest estimate that I have seen, the traffic through the Canal for the first two years after completion will be 10,500,000 tons per year, the railway company with which I

have the honor to be connected, alone carried 32,373,584 tons of freight in its last fiscal year. The average distance that freight was hauled by that company during the year was 155 miles, or more than three times the length of the Canal. In other words, this single railway company carried in a single year more than three times the volume of freight what the Canal is expected to carry in a year and carried it on an average more than three times the length of the Canal. This does not take into account the very considerable tonnage of express and mail handled by the railway company or the 18,119,253 passengers carried by it during the same year. When it is realized that the freight traffic statistics of this one railway operating in the Southeastern States represent only about one-seventieth of the total volume of freight carried in the United States in a year, some idea can be formed of the enormous relative importance of the public service performed by the railways of the United States, and of the vital interest of the American people in their prosperity and efficiency.

My purpose in referring to governmental regulation is to develop the idea that all regulations of the business activities of the citizen are not necessarily progressive. Their effect may be to retard real progress and to crush, or weaken, or damage one of the constituent parts of society. With respect to all such policies I think it is the part of wisdom to follow Lord Bacon's advice, "to beware that it be the reformation that draweth on the change, and not the desire of change that pretendeth the reformation."

Whether governmental regulation is to be restrictive of progress and opportunity will be dependent, in large measure, upon the wisdom which marks the enactment of our laws and their enforcement. It is upon the graduates of institutions such as this that we must rely for a large measure of leadership in sound thinking and conservative action. Under our system the governed are also the governors and

there is always the possiblity of abandoning harmful policies after their unwisdom has been demonstrated. I have faith, therefore, in the ability of the American people ultimately to settle all these questions aright. Whether it shall be done without our passage through a season of stress and trial will be largely dependent upon the degree to which our fellow citizens can be brought to a realization of the importance of policies that will preserve the widest range of opportunities.

I have spoken of the part to be played by public policies in preserving or restricting opportunities, but, important as these factors are, the degree of success attained by each one of you will be largely dependent upon the use which you, individually, make of your opportunities. In speaking of opportunities, I do not limit the meaning of the word to exceptional chances to achieve great success by a sudden stroke of fortune. The man who sits down to wait for an opportunity of this exceptional kind will often lead an unsuccessful life and will be unprepared for the exceptional chance if he should encounter it. The successful man is usually he who does not wait for something big but who makes the most of each day's opportunities, be they large or small. He searches for opportunities and makes them for himself, and we will generally find that, where a man has achieved some great and sudden success, he had been one of this persistent type and his good fortune, instead of being merely good luck, has been the result of his constant habit of making the most of every proper opportunity.

You are leaving the Stevens Institute of Technology and beginning your active business careers at a time when the world is looking for young men with technical training and with capacity for doing things. On every hand there is work to do in which the graduate of this Institution can find their opportunities. You may have to begin in subordinate positions, but with character, industry, and per-

sistence, you can face the future with confidence. I hope that each one of you may achieve the fullest measure of success and that each one of you may do his part in the progress of the future.

Valedictory Address by Jerome Strauss

Mr. President, Gentlemen of the Board of Trustees and of the Faculty, Classmates and Friends:

"There is an end to all.
To pleasure and to pain
To idleness and toil."

Today marks the end to four years of pleasant associations.

Joy and sorrow both are present for we rejoice at the attainment of a goal long sought and grieve at the severing of close comradeship with all those who have had during these four years so many daily interests in common.

The friendships that have been formed and strengthened within these walls we earnestly hope will last forever. True friendship with its kindly criticism, its effective assistance at crucial moments and its uplifting tendencies is rare, and fortunate are we to have formed such friendships during our college course.

Mr. President:

In few colleges do the students have an opportunity of coming into that close contact with their official head which we have at Stevens. And in this respect the Class of 1913 has been especially fortunate both within and without the classroom. We have learned, Mr. President, to place a high value on your abilities as a scholar and as a man of affairs and to appreciate your deep personal interest in the welfare of every Stevens man. And now, recognizing what you have done for your Alma Mater and knowing

what you hope to accomplish, we enthusiastically enlist for the campaign.

Gentlemen of the Board of Trustees:

You have given us the opportunity of laying a solid foundation for future construction work. You have given us a strong curriculum and a faculty well equipped to do the teaching required by this curriculum. You have also recognized that to obtain the full benefit from a college training an opportunity must be given for social intercourse, and have provided for this by authorizing Dr. Humphreys to acquire the famous Castle Stevens. As a class we have profited by the purchase of this property, and feel certain that future classes will appreciate, as we do, all of the advantages that have come to Stevens through the wisdom and foresight of its able Board of Trustees.

Gentlemen of the Faculty:

There is much to admire in the unselfish labor of the teacher. He certainly is one of those who believe that a successful life is marked by giving rather than by getting. During our college days we have been greatly influenced by your strong personality, and in the days to come will endeavor to live up to the high ideals which you have kept before us. We appreciate the interest that you have shown in all of our undergraduate activities, and assure you that it has done much to bring about the hearty spirit of coöperation between faculty and students that now exists at Stevens.

To those of you who are far more to us than mere friends; to you who have watched most eagerly for the realization of your long cherished hopes; to you who by precept and example have had so much to do with our success up to the present time, we would here express our deepest gratitude and pledge a future career of honest, earnest effort as a return for the many sacrifices that you have made for us.

Classmates:

This is an age of industrial progress. Economy is the watchword of the day. Waste is converted into utilities wherever possible. Glycerine, formerly a worthless by-product in the manufacture of soap, is now being converted into high explosives; scrap iron and steel at one time permitted to rust away in huge heaps now produce imposing structures and even the finest cutlery; executive working hand in hand with laborer has given us our scientific management, increasing production and hence the earnings of the latter and the profits of the former without additional labor from either. And to what class of men belongs the credit for most of this progress? Undoubtedly that class which combines successfully the engineer and the man of affairs. We are especially fortunate that the course at Stevens gives the student a knowledge of business matters as well as a purely technical training. Men of 1913: This day marks the end of many pleasant associations. Ambitious and confident we now start along different paths. Honesty of purpose and the employment of common sense will carry us successfully through the future years as they have through our college course. Now we separate. Reunions may be few and far between, but when they do come what pleasure will be ours as we recall the days at Stevens Tech, and the incidents of this Commencement week.

To each, and for each, I say farewell.

CLOSER AFFILIATION OF STEVENS ALUMNI CLUBS.

THE Stevens Club of Brooklyn has been considering for some time past the advisability of bringing the different alumni clubs into closer touch with each other. The Brooklyn Club communicated with the various other Stevens clubs throughout the country and finally called a meeting of representatives on the morning of Alumni Day, June 7, 1913, in the Memorial Room of the Morton Memorial Building. There were present at the meeting F. C. Fraentzel, '83, and W. R. Halliday, '02, of the Stevens Club of Newark; H. H. Mapelsden, '03, and R. H. Marvin, '03, of the Stevens Club of Schenectady; H. E. Williams, '00, of the Stevens Club of Pittsburgh; F. C. Freeman, '03, and A. C. Klein, '08, of the Stevens Club of Philadelphia, and David C. Johnson, '06, of the Stevens Club of Brooklyn; also J. H. Cuntz, '93, G. G. Freygang, '09, F. J. Gubelman, '89, Walter Kidde, '97, T. C. Stephens, '00, Prof. F. DeR. Furman, '93, Prof. A. F. Ganz, '95, and Dr. Alexander C. Humphreys, '81.

The meeting was called to order at 11 o'clock by David C. Johnson, president of the Stevens Club of Brooklyn, who was elected chairman. F. C. Freeman was elected secretary. Mr. Johnson then explained that the object of the meeting was "To discuss the matter of closer coöperation between the various individual Stevens clubs and with the Alumni Association." He stated that letters had been received from every one of the eleven Stevens clubs and that they were all in favor of some form of coöperation,

provided the movement was in harmony with the objects of the Alumni Association.

The following are the present Stevens alumni clubs:—Stevens Club of Newark; Southern Alumni Club; Stevens Club of Philadelphia; Stevens Club of Schenectady; Wisconsin Stevens Club; Western Stevens Club; Stevens Club of Pittsburgh; New England Stevens Club; Michigan Stevens Club; Stevens Club of Brooklyn, and European Branch Stevens Alumni Association.

It was pointed out that the Massachusetts Institute of Technology has an organization known as "The Technology Clubs Associated" which was organized in January, 1913, and Princeton has a somewhat similar association.

There was considerable discussion as to whether an association of Stevens clubs should be a part of the present Alumni Association, or be a separate organization, but having some offices in common with those of the Alumni Association, such as the secretary and the treasurer.

The following advantages of coöperation or consolidation were brought out at the meeting:—To keep alive and impart enthusiasm to the present clubs, to help organize new clubs, to inform clubs of the addresses of men in their vicinity, to notify clubs when prominent alumni or professors expected to visit their city so that a dinner or meeting might be held, to spread the fame of Stevens still further into all parts of the country, to notify alumni when the different clubs expect to hold their important dinners, so that traveling alumni in the neighborhood can attend, to obtain news items for the different Stevens publications, and to obtain opinions from the clubs in different parts of the country on subjects affecting the college or the alumni body.

Dr. Humphreys spoke at length regarding the desirability of acquainting the young men of the country with the many unique advantages which Stevens has to offer for engineering

education. He expressed himself as being heartily in sympathy with the movement to bring the clubs closer together.

A motion was made to appoint a committee to confer with a committee from the Alumni Association, for the purpose of studying the best form of organization. The chairman of the meeting appointed W. A. Shoudy, '99, F. C. Fraentzel '83, and F. C. Freeman,'03. The committee appointed by the Alumni Association to confer with the representatives of the clubs is composed of David C. Johnson, '06, Walter Kidde, '97, and T. C. Stephens, '00.

ANNUAL MEETING OF THE ALUMNI ASSOCIATION

THE annual meeting of the Alumni Association of Stevens Institute of Technology was held in the auditorium of the college at Hoboken on the evening of June 9, 1913, being called to order by President E. H. Peabody, '90, at 8:30 o'clock. The reading of the minutes of the midwinter meeting was dispensed with. All present standing, the secretary then read the following names of men connected with Stevens who had died since the midwinter meeting:

Stephen Squires Palmer, Trustee, S. I. T.,
Died January 29, 1913.
John Fritz, Sc. D., E. D. (Stevens 1907),
Died February 13, 1913.
Oscar Antz, '78
Died January 9, 1913.
Franklin B. Crosby, '09
Died April 20, 1913.

When the reports of officers were taken up, Mr. Peabody announced that he had no report, but referred to the minutes of the executive committee, appearing in the INDICATOR. He extended a cordial welcome to the Class of 1913.

The secretary made no report, but the treasurer read a preliminary report, stating that in its final form it would be published in the October INDICATOR.

Hosea Webster's report as retiring Alumni Trustee, which is given elsewhere in full, was then presented.

Walter Kidde, '97, in the absence of Henry Torrance, Jr., '90, then read the following report of the Graduates Fund Committee:—

"In conference with Henry Torrance, Jr., chairman of the Graduates Fund Committee, and after careful analysis of existing needs, for the distribution of the funds amounting to $5450.92 and collected for the year ending May, 1913, is recommended to be applied as follows:

To the general expenses of the year '12–'13 in the administration of affairs of Stevens Institute of Technology—for expenses incurred in operating Castle Stevens......	$3,350.92
To making of a layout and birdseye view of Castle Point Grounds for photographic post cards, etc........................	1,000.00
To necessary Castle changes, such as an ash vault and area way around lunch room, and miscellaneous odd repairs, urgently needed	1,000.00

"This disposes of all the funds collected in the course of the year and makes use of the money in a manner agreeable to Dr. Humphreys and where he says it is most urgently needed at the present time.

"The record of the Graduates Fund in the last three years shows subscriptions amounting to nine or ten thousand dollars, and it is a matter of congratulation for the Alumni Association. Indications are that next year will see a substantial increase in the fund which is gratifying and we hope this may be an incentive for still further work in the support of the President of our Alma Mater.

Hosea Webster,
J. W. Lieb, Jr.,
Walter Kidde,
Alumni Trustees."

The report was accepted as read with the thanks of the Association.

In the absence of F. J. Gubelman, '89, chairman, Professor Furman, '93, was called upon to make some remarks regarding the Publicity Committee.

For the Committee on Increase of Membership, J. A. Dixon, '91, reported as follows:

"Your Committee on Increase of Membership begs to submit a synopsis of the year's work and report briefly as follows:

"There were found to be 455 alumni who were not members of the Association, the addresses of 32 being unknown, and the first general canvass brought in but 12 applications for re-instatement.

"The result of a repeated general effort, compared with what was being accomplished by more individual work, persuaded us to pursue our work on the latter basis and as a result we have been able to submit to the Executive Committee

For Reinstatement	43
For Life Membership	2
For Associate Membership	16

"While compared with the number of alumni who are still non-members and the number of ex-classmen who are eligible to Associate Membership, the number of names submitted may seem small, but it must be remembered that a large amount of personal and individual work, mostly by correspondence, has been necessary, and we believe the work should not be dropped.

"Through the continued coöperation of Class Representative, Stevens Clubs and individuals a large number of valuable men may be added to our membership.

"We take this opportunity of thanking those who have rendered valuable assistance in the accomplishment of the results herewith reported.

"Respectfully submitted,

"Committee on Increase of Membership

Prof. F. DeR. Furman, '93
Robert Boettger, '98
Percy C. Idell, '99
J. A. Meeker, '07
J. A. Dixon, '91, *Chairman.*"

In the absence of R. S. Kursheedt, '80, chairman of the Stevens Luncheon Committee, Mr. Peabody made a few brief remarks on this subject.

H. A. Pratt, '04, then rendered the report of the Alumni Athletic Committee, stating that they had had a very successful and busy year and thanking the alumni for their support. At the conclusion of his remarks he presented to Dr. F. J. Pond a silver loving cup in recognition of his long service as treasurer of the Athletic Association.

Mr. Peabody then introduced J. D. Flack, '87, who spoke concerning Alumni Headquarters at the Castle. The Class of '87 has furnished the funds for fitting up the study-room on the third floor of the Castle.

Speaking as editor of the Indicator, G. E. Terwilliger, '09, expressed a desire to have the Indicator serve the alumni in every possible way, and pointed out the necessity for alumni coöperation and particularly that of the Class Representatives in furnishing news. He stated that he hoped for a surplus from the publication each year. He also stated that the scope of the Alumni Publicity Committee was necessarily somewhat limited, and that he believed that the Faculty Publicity Committee was in a much better position for the acquisition and distribution of news concerning the college proper.

F. C. Fraentzel, '83, reported for the Alumni Day Committee, in the absence of E. E. Hinkle, '90, chairman, and stated that indications pointed to a surplus in the committee's treasury.

The secretary then read the name of J. F. Haworth, '90, presented by the Executive Committee for election to active membership in the Association. Mr. Haworth was unanimously elected.

The secretary read the names of the following men who had been recommended by the Executive Committee for election to associate membership, and they were unanimously elected:

Edward T. Condon, Jr., ex '10	W. Dirk Van Ingen, ex '13
A. V. Johansen, ex '07	George L. Lancon, ex '96
S. X. Metzger, ex '09	Jerome D. Gedney, ex '96
Orien O. Oaks, ex '05	Wessels Van Blarcom, ex '93
Warren Garwin, ex '05	Harold A. Brangs, ex '09
Hampton D. Ewing, ex '90	John D. Lobb, ex '08

Dr. Edward D. Rudderow, ex '93

The amendment to Article 5, Section 1 of the Constitution, proposed at the midwinter meeting by the Executive Committee, was read as follows:

Article V., Section 1, now reading:

(a) The officers, together with the eight Directors, shall constitute the Executive Committee. The Alumni Trustees shall be ex-officio members of the Executive Committee. (June 10, 1908.)

(b) At least three of the members of the Executive Committee shall be residents of the State of New Jersey. (June 10, 1908.)

It is proposed to amend by adding a clause reading:

(c) The Past-Presidents of the Association shall be invited to attend all meetings of the Executive Committee, but as such, shall not count toward a quorum or be allowed to vote, except that the five Past-Presidents who last held office shall have regular voting power.

After discussion the amendment was adopted.

Mr. Peabody then stated that it was customary to present the accumulated interest of the Beneficiary Fund to the college, and a motion was carried to this effect.

A telegram from the Stevens Club of Michigan, sending their greetings to the Alumni Association was read. On motion of Mr. Cuntz the secretary was instructed to write to L. J. Schneider, '11, secretary of the Stevens Club of Michigan, expressing the appreciation of the Association.

Mr. Peabody then said a few words on Stevens Clubs, expressing a need for their coöperation and activity in the cause of publicity. D. C. Johnson, '06, told of a movement for the consolidation or affiliation of the clubs, and on his motion the president was authorized to appoint a committee of three to confer with a committee appointed by the clubs at the meeting of their delegates, to draw up plans for organization.

J. A. Dixon then proposed that the following resolutions relating to the secretaryship be spread upon the minutes in full, and published in the INDICATOR:

"WHEREAS, through the resignation of the Secretary of the Alumni Association of Stevens Institute of Technology early in the season of 1912 and '13 it became necessary for the Executive Committee to immediately appoint some one to fill this important office, and

"WHEREAS, the financial situation of the treasury of the Association made it difficult to pay the usual honorarium to the Secretary, and

"WHEREAS, Mr. Thomas C. Stevens, of the Class of 1900, agreed to accept the responsibilities of this office entirely without remuneration, and has at great personal sacrifice carried on the arduous work of the Secretary's office with satisfaction and dispatch, and has recently submitted a report to the Executive Committee containing recommendations of great value to the Association, therefore be it

"*Resolved*, That the thanks of the Alumni Association of Stevens Institute of Technology, at this Annual Meeting in Commencement Week, 1913, be and hereby is extended to Mr. Stevens in recognition of the services he had so ably

performed for this Association and for his Alma Mater."

Mr. Cuntz spoke of the possibility of holding a Stevens convention next winter, by making the dates of the various Stevens activities fall on successive days. There was some discussion in relation to this. W. A. Shoudy, '99, expressed the opinion that men out of town would be inclined to attend if the midwinter meeting and dinner were held on succeeding dates, and also that the meeting should be made a prominent feature as it gave alumni an opportunity to renew old acquaintances.

The announcement of those elected as officers and directors of the Alumni Association at the annual election was then made by the Secretary.

Professor Ganz nominated the following members of the Executive Committee for trustees of the Association:— J. H. Cuntz, J. A. Dixon, G. G. Freygang, J. S. DeHart and Walter Kidde, and there being no further nominations, moved that the secretary be instructed to cast one ballot for the election of these nominees. The motion was carried.

Dr. Humphreys then announced that E. H. Peabody had received the largest number of votes as Alumni Trustee, and that the trustees of Stevens Institute of Technology had ratified his election.

Dr. Humphreys made some further remarks, laying emphasis on the fact that the Graduates Fund had been of great help to him and Stevens, particularly at this time in facing a deficit of $37,000. He also stated that the outlook for recovering the collateral inheritance tax from the United States Government was better than ever before. Dr. Humphreys spoke of Stevens as furnishing a broad engineering course and of the desirability of interesting the right kind of young men to come to the college. He then announced the following gifts to the college during the year 1913:

"From Mrs. Henry Lang, for the purchase of the Robert L. Stevens land, $10,000. It was this gift which started the fund.

"From the late Stephen S. Palmer, Trustee, for the purchase of the Robert L. Stevens land, $25,000.

"John Aspinwall, Stevens, '81, paid bill of Frost and Bartlett for doctoring the trees on Castle Point, $410.

"An unnamed donor gave $1,000 to be applied as indicated by me. I have added it to the fund for the purchase of the Robert L. Stevens land. The donor particularly desires that his name shall not be announced in connection with this gift.

"From Thaddeus R. Beal, representing the heirs of his father, my old friend William R. Beal, $5,000 to establish a scholarship to be known as the William R. Beal scholarship. I recommend that the scholarship be so established.

"Rear Admiral George W. Melville, upon whom the Institute conferred the honorary degree of Doctor of Engineering, died March 17, 1912. In his will he bequeathed to the Institute $5,000 to be applied to the purchase of tools or apparatus for the Department of Experimental Engineering (Carnegie Laboratory), the donor's name to be attached thereto. There has been litigation in regard to Admiral Melville's will, so we have not yet received the bequest, but we have just been notified that the payment will shortly be made.

"From S. G. Rosenbaum, through R. S. Kursheedt, Class of '80, $100 to the Robert L. Stevens fund.

"From R. S. Kursheedt, to the Robert L. Stevens fund, $150.

"From four graduates of the Institute, J. W. Lieb, Jr., '85; John W. Howell, '81; A. W. Burchard, '85; and Herbert A. Wagner, '87, $550 to purchase a multipolar generator. A special price was given through the courtesy of the General Electric Company.

"From Mr. and Mrs. Andrew T. Connet, as an acknowledgment of the success in the engineering profession at-

tained by their son Frederick N. Connet, Class of '89, $500 to the Robert L. Stevens fund.

"From Gerard P. Herrick, in acknowledgment of services performed by Professor Pryor, $100 for special storeroom for the Carnegie Laboratory.

"From George Dinkel, Stevens '88, to the Robert L. Stevens fund $500.

"From Dr. Edward Weston, Trustee, additional equipment for the laboratory of Electrical Engineering.

"From the United States Motor Company, through W. E. S. Strong, Class of '92, the extensive and valuable exhibits used in the celebrated Selden Patent Suit, so long in the courts in connection with the manufacture of automobiles. These exhibits will be important additions to our museum when the museum is built.

"From the *Link of 1912*, published by the Class of 1913 during their Junior year, surplus after paying all costs of publication, $280.55.

"From the Class of 1913, in connection with their graduation, about $800 to be applied to the Gymnasium Fund. They also pledge $50 each to the same fund to be paid in a year or to carry interest until paid.

"The Classes of 1902 and 1912 have combined to pay for the alteration and equipment of a room in the castle, to be known as the Dungeon, and to be particularly used for reunions and dinners of the graduated classes. The cost is estimated at $1,500, and each of these classes has subscribed $750.

"The Class of 1903 will pay into the Institute treasury on Alumni Reunion Day about $250, in commemoration of the tenth anniversary of their graduation. This amount will be appropriated to the Robert L. Stevens fund or the Gymnasium Fund.

"From the Class of '87, for furnishing the Study Room on the third floor of the Castle, $325.

"From the Musical Clubs, to Gymnasium Fund, $100."

Mr. Peabody at this point ably recited a German poem introducing Professor Kroeh, much to the professor's amusement. After a few remarks from Professor Kroeh the meeting adjourned.

The following alumni signed the roll:

Philip E. Raque, '76
A. Riesenberger, '76
A. C. Humphreys, '81
Hosea Webster, '82
Fred C. Fraentzel, '83
Robert M. Anderson, '87
J. H. Cuntz, '87
J. Day Flack, '87
E. H. Peabody, '90
G. L. Todd, '90
A. P. Boller, Jr., '91
J. A. Dixon, '91
A. J. Post, '92
W. E. S. Strong, '92
A. D. Whitcomb, '92
F. DeR. Furman, '93
H. E. Griswold, '93
Albert F. Ganz, '95
W. J. Boucher, '96
C. G. Woolson, '96
Edwin R. Knapp, '97
Henry Samuel Morton, '97
R. C. Post, '98
W. A. Shoudy, '99
William F. Cox, '00
Louis A. Martin, Jr., '00
T. C. Stephens, '00
Wm. G. Broadhurst, '02
Leigh K. Lydecker, '02
R. F. Jacobus, '04
Harlan A. Pratt, '04
H. C. Gordon, '05
I. R. Lewis, '05
A. Obrig, '05
E. A. Stevens, Jr., '05
L. A. Hazeltine, '06
E. O. Heyworth, '06
David C. Johnson, '06
Francis MacLehose, '06
Henry F. Pratt, '06
Leon O. Hart, '07
Peter Minck, '07
W. Erlenkotter, '08
C. C. Phelps, '08
G. D. Thayer, '08
A. J. Carniaux, '09
G. G. Freygang, '09
G. E. Terwilliger, '09
Julius G. Berger, '10
F. C. Krause, '10
T. A. Wiley, '10
A. R. Lawrence, '11
Ronald K. MacMaster, '11
Albert D. Trenor, '11
L. A. Belding, '12
G. Breithaupt, '12
C. J. Dempwolf, '12
Walter F. Dombrowsky, '12
Walter H. Freygang, '12
Harold H. C. Lasker, '12
Quirin J. Schwarz, '12
J. D. Strobell, '12
Thomas P. Bradshaw, '13
J. Herbert Brautigam, '13
John J. Ehrhardt, '13
Theodore R. Eilenberg, '13
Chester Kingsbury, '13
K. R. Millspaugh'13
W. G. Nichols, '13
R. P. Pennoyer, '13
Robert Roesen, '13

Elias Schlank, '13
C. Wandel, '13
Theodore W. Weigele, '13
Robert L. Wellman, '13

The following members of the Faculty also attended:

Prof. Charles F. Kroeh
Dr. F. L. Sevenoak
Dr. Francis J. Pond

REPORT OF RETIRING ALUMNI TRUSTEE

By Hosea Webster, '82

TWENTY-FIVE years after his graduation from Cornell University, in the course of Mechanic Arts, the late Walter C. Kerr, for many years a Trustee of Cornell University, in a scholarly address to our Graduating Class of 1904, among many other good things said: "Just so far as education assisted by concentration contributes to singleness of purpose, it is useful, but, where, by length, breadth, or depth, it dilutes human effort, it lacks value."

Our attention has been so efficiently called to the present and future problems confronting our association, and for that matter the whole Institute organization, that it may be profitable and perhaps of some assistance to give consideration to the past and present accomplishments of our Alma Mater.

The organization which embraces the Stevens School and the Stevens Institute of Technology, may be considered as a complete institution equipped to cover eight years continuous Academic and Technical Course, admitting boys at the age of thirteen.

The Corporation is governed by a Board of Trustees, nominally twenty in number, of whom there are now eighteen members, including the three alumni representatives. On this Board are men of prominence and great influence and ability in industrial, financial, educational and social affairs of the Nation.

The educational activities of the Institute are carried on by a Faculty, twenty of whom are teaching some three hundred boys and young men in the Stevens School, and in the

Institute proper by a Faculty consisting of three professors emeritus; twelve full professors; eight assistant professors; eleven instructors; one superintendent of shop practice and shop assistants, mechanics, laboratory assistants, superintending engineers, etc., aggregating over fifty.

At the present writing there are enrolled and in good standing in the Institute:

92 Freshmen,
75 Sophomores,
73 Juniors,
69 Seniors,

making a total of over 600 students, including 300 of the Stevens School.

The four years course in the Stevens School is characterized by simplicity and covers arithmetic, algebra, plane and solid geometry, plane trigonometry, English throughout the four years, physical geography, chemistry and physics, English and United States history and Civics, Free Hand and Mechanical Drawing and French, German or Latin.

In the Institute there are Departments of

Chemistry,
Descriptive Geometry,
Mechanical Drawing,
Economics of Engineering,
Electrical Engineering,
Engineering Practice,
English and Logic,
Experimental Engineering,
Mathematics,
Mechanics,
Mechanism and Machine Design,
Modern Languages,
Physics,
Shop Practice,
Structural Engineering.

Each department is under the direction of a competent professor.

It is perhaps well to quote from the Institute catalogue as follows:

> No effort is spared to make instruction in each department harmonize with, reinforce and supplement the work in all other departments. From the first it was the aim of the late President, Dr. Henry Morton, to offer a course of instruction in which theory and practice were carefully balanced and thoroughly combined.

Stevens Institute of to-day is a natural and consistent growth from the Stevens of thirty years ago, holding strictly in every department to the fundamental idea of thoroughness and quality in the doing of all those things which have to be done.

The paper read at Detroit, in June, 1908, before the Society for the Promotion of Engineering Education, by Prof. F. de R. Furman, upon the careers of graduates of Mechanical Engineering, and published in the INDICATOR for October, 1908, has as one purpose "The measure of success of graduates in Mechanical Engineering, based upon the records of all the graduates of the Stevens Institute of Technology during 35 years following the founding of the Institute in 1871."

Professor Furman's paper is based upon a careful analysis of facts, studied from every conceivable view-point. He shows that the number of graduates each year has steadily grown and he shows out of those who have graduated, from Stevens up to and including the Class of 1908, the percentage who had risen to positions of responsibility as owners, officers and managers or department heads in responsible charge, as follows:

Of those who had been graduated 30 years—98.1 per cent.
Of those who had been graduated 25 years—96.5 per cent.
Of those who had been graduated 20 years—94.4 per cent.
Of those who had been graduated 15 years—90.0 per cent.
Of those who had been graduated 10 years—80.7 per cent.
Of those who had been graduated 5 years—48.3 per cent.

19 per cent were in the employ of large corporations. But 5 per cent had entered occupations in no way associated with manufacturing or engineering work. He shows that Stevens graduates up to 1908 were engaged in over 400 different specialties, covering nearly every form of development, manufacture and use of our natural resources.

Reference to the last Institute catalogue will show that there has been no falling off in the measure of success of Stevens graduates.

May we not be proud of the fact that this showing is convincing evidence that as a preparation for taking part in the great material and industrial development of our country, the course at Stevens Institute is efficient and successful. Certainly every one of you know and will never forget that his Stevens degree of Mechanical Engineer means that he has done work—hard work—and lots of it and that it has always been for quality and high efficiency.

It seems proper to make known at this point a fact with relation to the Stevens School, which is significant at least.

Two boys who had made flat failures in their home high schools in one of our prominent suburban towns, and another from the same town who had failed to make any headway in any one of half a dozen schools to which he had been sent, are now at Stevens School and each a credit to himself, to his teachers and a source of parental pride. Those of you who are parents, know what it means to have your children do well in school or college, and if you are honest, you know how large a share of that success is due to the spirit of the Institution which is merely the manifestation of the composite ability, integrity, character and personality of those who make up the Faculty and Administrative Board from the Principal or President down to the janitor.

The position which Stevens holds among technical institutions, is due largely to the tireless and unselfish devotion, individually and collectively, of the whole Faculty and oper-

ating organization, under the direction of Dr. Morton and of Dr. Humphreys, to all of whom too little credit has been given. When in the future the history of our country's great industrial development has been written, the highest honor will be given to those who, as teachers, have given the best years of their lives to the rising generation of young men and to those who by their generosity and devotion, have provided for these teachers and these young men the educational facilities without which our national greatness would have been impossible.

When to the great environment advantage, and environment is certainly an influence of great weight, due to its proximity to the great industrial centers and activities in and about New York City, there is added the equipment of buildings, dormitories, residences for President and Faculty, as planned by Dr. Humphreys, giving more complete control over the habits of thinking, doing and growing of the young men during the most critical formative period of their lives, our beloved Alma Mater will become a still greater influence and power, not because of its bigness, not because of its great diversity of courses, optional and required, not because of its great breadth and probable consequent shallowness and distracting diversity of courses and potpourri of intellectual and mental gymnastics, but because of the mental atmosphere, of the rigid adherence to physical and mathematical exactness necessarily characteristic of a purely engineering and technical education.

The elevated prominence and the proximity of Castle Point to our country's greatest industrial, social and intellectual center must make it most attractive to educators of prominence and superior ability and accomplishments.

In a letter addressed to the Board of Trustees, individually and collectively, preliminary to their recent annual meeting, Dr. Humphreys outlined clearly the present condition of our affairs. He says in this letter:

During the ten years of my presidency I have secured contributions amounting to almost $600,000. I have worked in many directions to secure for the Institute the interest of those well able to help and especially those who have been enriched through the industries, and I hope I have made some progress, but it is weary waiting. I have opened the way and I am willing to go forward to the full extent of my ability and strength. During the past year I have been carrying burdens in the Institute and outside, which unaided I cannot carry another year. I have worked unceasingly in this connection during the ten years of my presidency and if I may be pardoned for being personal, I have sacrificed four-fifths of my previous income through my official connection with the Institute.

There are probably few of you who do not know that it requires something besides the dollar mark to measure the sacrifices which Dr. Humphreys has made and is making, not because of any proportionate obligation assumed or implied, not for the honor or greater glory of it, but that a greater number of the coming generation of our young men may have the privileges of that thorough and efficient preparation for the higher and better responsibilities of the life of today which has been, and is, and more than ever will be, behind the degree at Stevens Institute.

It is always darkest just before dawn and there are in our Board of Trustees, in our Faculty and in our alumni, so many men of great affairs, of great accomplishments and of great things, that the labor, the sacrifices and the devotion of Dr. Humphreys will and must be rewarded by immediate development of his great and comprehensive plan for an up-to-date educational institution which I sincerely believe will show how to effectively prepare young men for the greater than ever problems before our great nation.

While it has not been possible to gather statistics, it is probably true that the great and rapidly increasing popularity of courses in the Science of Agriculture, is largely responsible for the material decrease in the number taking courses in civil and mechanical engineering in all technical schools and colleges.

If there were in every class and department, as many students as it could conveniently accommodate, the resulting increase in our income would nearly if not quite solve one serious problem, the annual deficit due to the fact that while our cost per student is said to be lower than any similar institution, even at that our income is less than our expenditures.

The alumni of Stevens have a splendid working organization and it is suggested that the greatest possible assistance and aid can be given, if now and in the future, this organization's energies are devoted to a campaign whose sole object shall be an increase in the number of students.

The situation, therefore, presents not in any sense a duty to any of you, but a privilege to all, alumni, Faculty and Trustees, to associate and combine in the development and fruition of a plan which because diverted to the right education of those who are to influence our future national character, therefore, is purely patriotic and because patriotic must of necessity, particularly in these times, call forth the best effort in every one of you.

OBITUARY

FRANKLIN BUTLER CROSBY

Franklin Butler Crosby, Stevens '09, was killed in an automobile accident near Taunton, Mass., on Sunday, April 20, 1913.

In his death Stevens loses a son who was true to the highest ideals for which the college stands. He was capable to a marked degree and possessed the ability to direct his knowledge and initiative into such practical channels that he had risen to a position of unusual authority for a man not yet four years graduated. Blessed with a winning personality, "Chub," as his college friends best knew him, had the facility of making his acquaintances his firm friends. He had a cheery word for all and was never too busy to tackle a problem that had perplexed a neighbor.

Mr. Crosby was twenty-five years old, the son of the late William Bedlow and Maria Theresa Hall Crosby. He was unmarried and lived at Short Hills, N. J., with his aunt, Miss Josephine Hall.

At Stevens Mr. Crosby made an enviable record. He stood high in scholarship and was a member of the honorary association of Tau Beta Pi. He was also a member of the Beta Theta Pi fraternity, and of Scarab. He was manager of the track team in his senior year, an associate editor of *The Stute* and was interested generally in athletics. Upon graduation he entered the employ of Gunn, Richards & Company, later leaving that firm to become associated with J. W. DuB. Gould, specializing in production engineering and similar work. He was connected with the American Locomotive Works, in their automobile department at Providence, as a representative of Mr. Gould at the time of his death.

Stevens Indicator

PUBLISHED QUARTERLY BY

THE ALUMNI

OF THE

STEVENS INSTITUTE OF TECHNOLOGY

HOBOKEN, N. J.

MANAGING EDITOR

GERALD E. TERWILLIGER, '09

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EDITORIAL COMMENT

Baseball or Lacrosse?

Among alumni as well as undergraduates much complaint is heard concerning the lack of success of some of the athletic teams for several seasons past, and the old question has come to the front more prominently than ever before whether Stevens should attempt to support two major sports such as baseball and lacrosse during the spring athletic campaign. Just at present there seem to be more and more converts to the belief that the college cannot maintain two separate teams to advantage. That one team draws good men from the other is indisputable. But which to abolish? There are sound arguments in favor of retaining either baseball or 'acrosse as against the other. The INDICATOR does not mean to ally itself with either camp, but merely desires to bring the matter forcibly to the attention of the alumni and especially to the recently organized Athletic Council, which would appear to have jurisdiction. No step should be taken unadvisedly, or without due consideration

of the rights of all concerned, but there is a vital problem to be faced, and the sooner it is faced honestly and squarely, the sooner may its proper solution be expected.

Alumni Clubs

Active steps have been taken to consolidate and enlarge the Stevens clubs scattered over this country and Europe. It has been felt in many quarters that the Stevens alumni clubs were not doing as efficient and widespread service as they might under a scheme of coöperation. Through the energy of the officials of the Stevens Club of Brooklyn the matter has been brought to a head, and a committee is already at work upon a plan which will supplement the activities of the Alumni Association without conflicting with the general alumni body. The question of organizing new clubs in undeveloped territory, and reviving those which have fallen into a moribund state is to be met. With such a system of coöperation in force, and with the use of the office of the secretary of the Alumni Association as a clearing house of alumni news, the alumni should be brought into closer touch with each other, and greater things for Stevens made possible.

Profitable Year Ahead

The Alumni Association has entered a new fiscal year with a comfortable bank balance and a record of achievement that is highly creditable to the retiring administration. There are plans in view which promise a still further advance in usefulness. It is proposed to combine certain of the fixtures, such as the annual dinner and the midwinter meeting, in order to hold a Stevens Convention, a monster reunion of graduates who would make the trip to New York over the week-end and attend the various functions

of the two-day session. So great was the success of the theatre party, that 1914 will surely see another of these enjoyable functions. Altogether it looks like a most interesting program. Did it ever occur to you what a favor you might do some non-member by telling him of the useful activities of the Alumni Association? And while thinking of this, remember that students who did not graduate are eligible for associate membership.

ALUMNI DIRECTORY

ALUMNI ASSOCIATION OFFICIALS

President.................................J. H. CUNTZ, '87
First Vice-President........................J. ALFRED DIXON, '91
Second Vice-President...................WILLIAM E. S. STRONG, '92
Secretary..............................GUSTAV G. FREYGANG, '09
Treasurer..............................LOUIS A. MARTIN, JR., '00

Directors: Term Expires 1914—F. J. GUBELMAN, '89; H. E. GRISWOLD, '93; R. C. POST, '89; R. W. PRYOR, JR., '02. Term Expires 1915—JOHN S. DEHART, '90; FREDERICK A. MUSCHENHEIM, '91; CHARLES H. MCCULLOUGH, JR., '91; FRANK E. LAW, '92.

Trustees: J. H. CUNTZ, '87; JOHN S. DEHART, '90; J. A. DIXON, '91; WALTER KIDDE, '97; GUSTAV G. FREYGANG, '09.

Alumni Trustees: WALTER KIDDE, '97; JOHN W. LIEB, JR., '80; ERNEST H. PEABODY, '90.

Stevens Institute Alumni Association (European Branch)—LAFAYETTE D. CARROLL, '84, *Acting Secretary*, 36–38 Victoria St., London, S. W., England.

Stevens Club of Newark—W. R. HALLIDAY, '02, *Secretary*, Stevens Institute of Technology, Hoboken, N. J.

Stevens Club of Brooklyn—WILLIAM E. PAULSON, '04, *Secretary*, 13 Fulton St., Brooklyn, N. Y.

Southern Alumni Club—A. M. NORRIS, '07, *Secretary*, 1412 Continental Bldg., Baltimore, Md.

Stevens Club of Philadelphia—J. B. KLUMPP, '94, *Secretary-Treasurer*, U. G. I. Co., Philadelphia, Pa.

Stevens Club of Schenectady—RICHARD H. MARVIN, '03, *Secretary-Treasurer*, General Electric Co., Schenectady, N. Y.

Wisconsin Stevens Club—Cornelius T. Myers, '00, *Secretary*, General Motors Co., Detroit, Mich.

Western Stevens Club—A. K. Hamilton, '95, *Secretary*, 143 Liberty St., New York City.

Stevens Club of Pittsburgh—E. A. Condit, Jr., '02, *Secretary-Treasurer*, 2348 Oliver Bldg., Pittsburgh, Pa.

New England Stevens Club—F. M. Gibson, '01, *President*, American Sugar Refining Co., Boston, Mass.

CLASS REPRESENTATIVES

'73.—J. A. Henderson, 120 North 19th St., Philadelphia, Pa.
'74.—H. W. Post, Box 415, Mountain Lakes, Boonton, N. J.
'75.—S. D. Graydon, Stevens Institute of Technology, Hoboken, N. J.
'76.—A. Riesenberger, Stevens Institute of Technology, Hoboken, N. J.
'77.—F. E. Idell, 50 Church St., New York City.
'78.—A. A. De Bonneville, 132 Nassau St., New York City.
'79.—John S. Cooke, 364 Broadway, Paterson, N. J.
'80.—J. W. Lieb, Jr., 55 Duane St., New York City.
'81.—R. M. Dixon, 2 Rector St., New York City.
'82.—Hosea Webster, 85 Liberty St., New York City.
'83.—F. C. Fraentzel, 804 Broad St., Newark, N. J.
'84.—W. L. Lyall, 439 Aycrigg Ave., Passaic, N. J.
'85.—A. W. Burchard, 30 Church St., New York City.
'86.—F. A. LaPointe, 63 Eighth St., Hoboken, N. J.
'87.—J. D. Flack, "Orienta," 302 West 79th St., New York City.
'88.—Richard Beyer, 902 Hudson St., Hoboken, N. J.
'89.—F. J. Gubelman, 47 West 34th St., New York City.
'90.—E. H. Peabody, 85 Liberty St., New York City.
'91.—C. G. Atwater, 17 Battery Place, New York City.
'92.—W. O. Ludlow, 12 West 31st St., New York City.
'93.—E. D. Lewis, 185 Madison Ave., New York City.
'94.—G. B. Fielder, Cartaret Trust Co., Sip Ave., Jersey City, N. J.
'95,—A. F. Ganz, Stevens Institute of Technology, Hoboken, N. J.
'96.—W. H. MacGregor, 165 Broadway, New York City.
'97.—J. M. Towne, 54 Walnut St., East Orange, N. J.
'98.—Robert Boettger, United Piece Dye Works, Lodi, Bergen Co., N. J.
'99.—J. S. Henry, Safety Car Htg. & Ltg. Co., 2 Rector St., New York City.
'00.—H. L. Underhill, Consolidated Gas Co., 501 East 21st St., New York City.

ALUMNI DIRECTORY

'01.—A. Siegele, Jr., 167 Lenox Road, Flatbush, Brooklyn, N. Y.
'02.—L. K. Lydecker, 2 Rector St., New York City.
'03.—S. H. Lott, Stevens Institute of Technology, Hoboken, N. J.
'04.—C. E. Hedden, Stevens Institute of Technology, Hoboken, N. J.
'05.—I. R. Lewis, care of Walter Kidde, 140 Cedar St., New York City.
'06.—L. A. Hazeltine, Stevens Institute of Technology, Hoboken, N. J.
'07.—Peter Minck, Kilbourne & Jacobs Mfg. Co., 25 Broad St., New York City.
'08.—G. D. Thayer, 24 Monticello Ave., Jersey City, N. J.
'09.—G. E. Terwilliger, 1 Liberty St., New York City.
'10.—Nelson Ogden, New London Ship & Engine Co., Groton, Conn.
'11.—S. J. Bell, Babcock & Wilcox Co., Bayonne, N. J.
'12.—Russell G. Hess, 709 Billings Ave., Paulsboro, N. J.

NEWS OF STEVENS MEN

'76

William Kent's present address is 120 West 32nd Street, New York City.

'80

Theodore A. Elliott has changed his address to 205 Central Avenue, Cranford, N. J.

'84

H. deB. Parsons gave a lecture illustrated with lantern slides in the auditorium of Stevens Institute of Technology on April 3. Mr. Parsons' subject was "Three Hundred Years of Engineering Development in the Hudson River Valley."

Dr. David S. Jacobus gave an illustrated lecture on "Boilers" at a meeting of the Detroit Engineering Society on March 7.

'85

John M. Rusby, engineer of tests of the United Gas Improvement Company, made an address on "Industrial Combustible Gases," before the mechanical and engineering section of the Franklin Institute in Philadelphia on April 24.

'86

William W. Randolph has removed his offices to the Woolworth Building, 233 Broadway, New York City.

'87

Robert M. Anderson is with Murphy & Bolanz, 1004 Commerce Street, Dallas, Texas.

J. H. Cuntz has been elected vice-president of the Board of Trustees for Industrial Education of the City of Hoboken. The 1913 volume of the "Sentry," the year book of the Hoboken Academy, is dedicated to Mr. Cuntz.

'88

Richard Beyer has been appointed a member of the Board of Trustees for Industrial Education of the City of Hoboken. Mr. Beyer, H. L. Ebsen, '89, and Prof. F. De R. Furman, '93, acted as judges of the draw-

ings made by pupils of the evening classes of the Industrial School this spring. This appointment was made by Governor Fielder, of New Jersey, who is a brother of George B. Fielder, '94.

'89

W. W. Jackson is with the Regina Company, Rahway, N. J.

'90

The address of Samuel F. Smith, is in care of William Cubitt & Company, 258 Gray's Inn Road, London, W. C., England.

'91

In a recent letter to President Humphreys, Dr. George L. Manning says:

"Your very kind note of inquiry regarding my plans for the sabbatical leave has just been received.

"I am looking forward with much pleasure to spending a year, mostly in America, and one of the chief pleasures is that of renewing acquaintance with my Alma Mater and those of her sons whom I know. I am counting on being away during the college year of 1914–15." Dr. Manning is professor of physics in Robert College, Constantinople, Turkey.

'92

Nicholas S. Hill, Jr., was recently appointed chairman of the Advisory Commission of Engineers on the Jerome Park filtration plant for the City of New York. The appointment come from the Corporate Stock Budget Committee of the Board of Estimate and Apportionment.

Henry C. Meyer, Jr., is now located at the Architects Building, 101 Park Avenue, New York City.

W. O. Ludlow, of the firm of Ludlow & Peabody, is now located in the Architects Building, 101 Park Avenue, New York City.

'93

Mors O. Slocum is with Haines & Slocum Company, 259 Monroe Avenue, Rochester, N. Y.

Harry Holden MacCord, ex–'93, has passed the Michigan Bar examinations. With one other he obtained the highest average among the seven candidates who passed the examinations. Mr. MacCord studied law while keeping up his regular work with the company for whom he has worked since leaving Hoboken nine years ago. His address is 202 Commonwealth Avenue, Detroit, Michigan.

H. H. Adams is now Superintendent of Equipment of the Chicago Railways Company, 3901 West End Avenue, Chicago, Ill.

'97

In the preface of his recent work upon "Steel Rails," William H. Sellew, expresses his appreciation of the assistance of Harry D. Tiemann in preparing the section concerning Impact.

Harold W. Anderson is with the General Chemical Company at Marcus Hook, Pa. His address for mail is Box 381, Ridley Park, Pa.

'98

M. Penderell Walker was married to Miss Landis on December 26, 1912, in Tokyo Cathedral, Japan. Mr. and Mrs. Walker are now back at St. John's University, Shanghai, where he is professor of mathematics.

'99

A. G. Sidman has been resident engineer during the construction of a power house at Hauto, seven miles from Mauch Chunk, Pa., to supply current to the Lehigh Coal and Navigation Company, and to industrial plants within a radius of 175 miles. Three turbo-generators of 10,000 KW. capacity each are to be installed at the start. They will generate three-phase current at 11,000 volts, which will be stepped up by transformers to a transmitting voltage of 110,000.

Miss Grace E. Clark, daughter of Mr. and Mrs. William N. Clark, of 1302 Garden Street, Hoboken, N. J., was married to Charles N. Morley, on June 25, Mr. and Mrs. Morley will make their home in Hoboken.

'00

Charles B. Buerger, who for the last two years has been senior assistant engineer in the filtration division of the Department of Water Supply, Gas and Electricity, of New York City, has joined the staff of George W. Fuller, consulting hydraulic and sanitary engineer in New York. From 1900 to 1903 Mr. Buerger was with the Atlantic Refining Company, of Philadelphia. In 1906 he entered the service of the Bureau of Water of Philadelphia, remaining until 1911 as mechanical engineer in charge of designs for city water supply and filtration equipment and stations. His work in the Department of Water Supply, Gas and Electricity of New York City was on the design of the Jerome Park filter plant.

Miss Helen Christie was married to William Babcock Prince at St. Louis, Mo., on April 26.

'01

I. BENJAMINS has changed his address to 76 Havemeyer Street, Brooklyn, N. Y.

'02

WILLIAM H. TAYLOR is now manager of the Omaha Gas Company, 1509 Howard Street, Omaha, Neb.

'04

WILLIAM A. LEDDELL has recently accepted a position as Mechanical Engineer with the Detroit Copper Company, and is located at the Company's mine in Morenci, Arizona.

R. H. MOUNT has changed his address to 48 Irving Place, Redbank, N. J.

The address of H. B. GAYLORD, is now Room 730, 30 Church Street, New York City.

GEORGE N. CALKINS' present home address is 119 Essex Street, Hackensack, N. J.

CHARLES M. WILLIS is assistant gas engineer with the J. G. White Management Corporation, 43 Exchange Place, New York City. His home address is 49 Oakview Avenue, Maplewood N. J. Mr. Willis was married on June 11, 1912, to Miss Dorothy MacLeod Patterson, of Trenton, N. J.

'05

L. C. EVERETT is now engineer with the Marconi Wireless Telegraph Company of America, located in the Woolworth Building, New York City.

GEORGE A. BALZ has changed his address to P. O. Box 327, Perth Amboy, N. J.

JAMES A. TWEEDY'S address is Babylon, Long Island.

'06

L. A. HAZELTINE has recently been elevated to the rank of Assistant Professor of Electrical Engineering. He was previously instructor in the same department.

In the preface to the second edition of the D'Este Steam Engineers' Manual acknowledgment is made of the obligations of the compilers to WILLIAM R. VAN NORTWICK for his section on the Steam Engine Indicator.

A son was born to Mr. and Mrs. BURCHARD PRESCOTT ROMAIN on March 3, and has been named after his father.

Miss Lucy Roberts Budlong, daughter of Mr. and Mrs. Thomas S. Budlong, of Plainfield, N. J., was married to JAMES EDWARD PINKNEY on June 5. FRANCIS MACLEHOSE was best man, and LEROY DAVEY, HENRY F. PRATT and RAYMOND C. LEWIS were ushers. On the return

from his wedding tour, Mr. Pinkney was treated to a surprise at the hands of the apprentices in R. Hoe & Company's apprentice school of which he is the head. The head of the concern and a large number of employees were present when a testimonial was presented to Mr. Pinkney by the students of the school.

H. H. Davis is with the Crucible Steel Company of America, Pittsburgh, Pa., in their sales department.

'07

A daughter, Dorothy, was born to Mr. and Mrs. Merritt B. Lum on May 12.

Miss Isabelle E. Deshon, of Ridgewood, N. J., was married on May 10 to Loyal A. Williamson.

E. G. Hatch has changed his address to 149 Broadway, New York City.

'08

Charles C. Phelps is now on the publicity staff of the Ingersoll-Rand Company, at 11 Broadway, New York City. His home address is now 932 Hudson Street, Hoboken, N. J.

R. P. Aylsworth is with the Stevens-Aylsworth Company, 114 Liberty Street, New York City.

L. J. Carling's present address is 404 Summer Street, Stamford, Conn.

C. B. White is now Chemical Engineer with the Vulcan Detinning Company of Sewaren, N. J.

Willard T. Fletcher is with the Western Union Telegraph Company, at 195 Broadway, New York City.

'09

Miss Francis Esther Shields, daughter of Mr. and Mrs. Henry Lincoln Shields, was married to Adrian Alfred Williamson at the Reformed Church, North Hackensack, N. J., on June 2.

Albert E. Sierad has changed his residence to 6327 Walnut Street, East Liberty, Pittsburgh, Pa.

A son was born to Mr. and Mrs. Joseph J. Amberg on May 7, He has been named Robert Joseph Amberg.

Wells A. Lippincott is now Manager of David E. Kennedy, Inc., in the Caxton Building, Cleveland, Ohio.

Gustav G. Freygang was granted the Degree of Master of Arts by Columbia University at the June commencement.

Joseph K. Blum is now with the Gardner Crusher Company, at 556 West 34th Street, New York City.

R. W. Smith has gone to Japan in the interests of the General Electric Company. His address is in care of J. R. Geary, 23 Water Street, Yokohoma, Japan.

F. L. Eidmann has been in charge of the course in gas engines at the Lansing, Mich., Y. M. C. A. for three years. The Lansing Y. M. C. A. was one of the first in the country to offer a course in practical gas engine work. Eidmann handles the course in addition to his duties with the Seager Engine Works.

B. H. Hirschensohn's present address is 1009 Chapel Street, Cincinnati, Ohio.

The home address of W. P. Wright is 133 Charles Street, Jersey City Heights.

Miss Maude Rabold Yeager, daughter of Mrs. Anna M. Yeager, was married to Thorn Birdseye at Altoona, Pa., on June 7.

Carl H. Ludwig, was married on June 24 to Miss Mary Isabel Forcier, daughter of Mr. and Mrs. Joseph J. Forcier, of Milwaukee, Wis.

Walter J. Willenborg, ex-'09, was married on May 8, 1913, to Miss Rose Marie Timken, daughter of Mr. and Mrs. J. Henry Timken, of Hoboken, N. J.

'10

Ralph H. Upson won the National Championship Balloon Race on July 4 in the balloon "Goodyear," entered by the Goodyear Aero Club, of Akron, O., which Mr. Upson was largely instrumental in founding, and of which he is secretary. This club was formed about two months ago, for the purpose of making pleasure balloon trips from Akron, and was the direct result of a single experimental trip made to ascertain the availability of natural gas for such a purpose. It was such a success that a club was at once formed, which now has a large active membership, with a large number on the waiting list to make flights. The ascents are made nearly every Saturday when the weather is good, three passengers being taken at a time. The trips last from one to twelve hours.

A. Heller is with the L. Helmuth Company, 17 Battery Place, New York City.

W. deL. Carr is with the U. G. I. Company, Broad and Arch Streets, Philadelphia, Pa. For the present his mail address is P. O. Box 65, Hammond, Indiana.

Cecil I. Cady is with the American Steel Wire Company, New Haven, Conn. His home address is 136 Pine Street, New Haven.

'11

Herbert E. Preston is now employed as a Taylor Stoker Test Engineer with the American Engineering Company, of Philadelphia.

A. H. Harris, Jr., has accepted a position with the Providence Gas Company, Market Square, Providence, R. I.

Louis J. Platt, ex-'11, is now with the American Trimmer Manufacturing Company, Hoboken, N. J.

William Brehmer's address is 118 Cypress Avenue, New York City.

'12

John L. Entwisle is with the U. G. I. Company, of Philadelphia. His address is Central Y. M. C. A., 1421 Arch Street, Philadelphia, Pa.

John A. Malone is with the Standard Oil Company of New York, Marshall Building, Ballard Road, Bombay, India.

G. L. Clouser's address is 932 W. Huntingdon Street, Philadelphia, Pa.

Announcement was recently made of the engagement of Miss Marguerite Sandford Burdette, of Bayonne, N. J., to Loris R. Anderson.

Miss Helen Remsen Anthony, daughter of Mr. and Mrs. William R. Anthony, was married to John Franklin Perry, ex-'12, at the residence of the brother of the bride, 255 Ballantine Parkway, Newark, N. J., on June 3. Mr. and Mrs. Perry are residing at 30 Fabyan Place, Newark, N. J.

L. B. Paterson is engineer in charge of Boiler Water Purification with the Nichols Copper Company, of Laurel Hill, L. I. His address for mail is 121 Russell Street, Brooklyn, N. Y.

Conrad Freeman has accepted a position with the United Gas Improvement Company, in their Industrial Appliance Department at Eleventh and Market Streets., Philadelphia, Pa.

Raymond Loughlin has moved to 181 Vernon Avenue, Brooklyn, N. Y.

R. G. Hess is with the Western Electric Company, 463 West Street, New York City. His home address is 5 Park Place, Red Bank, N. J.

Charles W. Huber is a special apprentice with the N. Y. C. & H. R. R. in their locomotive shops at Avis, Pa.

'13

W. Dirk Van Ingen, ex-'13, is with the Bureau of Medical Statistics Mutual Life Insurance Company, 32 Nassau Street, New York City.

The engagement has been announced of Miss Eleanore de Groff Sherwood, of Hackensack, N. J., and Robert Hall Lansdell.

Mr. and Mrs. John Franklyn Berry, of Brooklyn, N. Y., have announced the engagement of their daughter, Margaret Voorhees, to John Henry Vander Veer.

ALUMNI NEWS

EXECUTIVE COMMITTEE MEETINGS

A meeting of the Executive Committee of the Alumni Association was held at Castle Stevens on Wednesday evening, April 9, 1913. The following were present: Messrs. Peabody, Martin, Kidde, Dinkel, Dixon, Cuntz, Post, Gubelman, Humphreys, Kursheedt, Anderson and Terwilliger.

The minutes of the preceding meeting of March 12 were approved with certain corrections noted.

Mr. Dixon offered and Mr. Cuntz seconded the motion that the application of H. L. Bolton, '02, for life membership, and William C. Cuntz, '92, for reinstatement, be approved, and that the application of George L. Lancon, ex '96, for associate membership, be presented at the annual meeting.

Mr. Gubelman reported for the Alumni Publicity Committee and noted the appointment of a sub-committee to handle matters in connection with Alumni Day.

Mr. Peabody reported progress on behalf of the Alumni Day Committee.

Speaking for the Luncheon Committee, Mr. Kursheedt reported that the committee advised going ahead slowly in the matter. Mr. Gubelman offered and Mr. Dinkel seconded a motion that the entire matter be referred back to the committee with authority to do as it deemed best. On motion of Mr. Kidde, seconded by Mr. Post, it was moved that the matter of the Alumni luncheons be presented to the class representatives by Mr. Terwilliger the following evening and that their attitude be communicated to the chairman of the committee.

On motion of Mr. Post, seconded by Professor Martin, the report of the nominating committee was received and the committee continued, with power to substitute names in the event that any person named could not serve, and to arrange the ballot.

On motion of Mr. Kidde, seconded by Mr. Post, it was moved that the question of the salary of the Secretary of the Alumni Association, the handling of the accounts of the INDICATOR, the employment of a stenographer, and the administration of other details connected therewith, be submitted to a committee consisting of Messrs. Cuntz, Martin and Terwilliger, with power to act.

The president was authorized to appoint a committee to confer with the students concerning presentation of "The Blazer Girl" during commencement week, with power to act, on motion of Professor Martin, seconded by Mr. Dinkel.

A letter from Edgar Palmer, acknowledging receipt of resolutions of the Executive Committee on the death of his father, Stephen S. Palmer, was received and read.

On motion of Mr. Cuntz, seconded by Mr. Post, the matter of the preparation of suitable letter-heads for the association and its allied activities, and the question of the desirability of making such letter-heads uniform with those in use by the departments of the college, were referred to a committee consisting of Messrs. Stephens, Martin and Terwilliger.

Mr. Dixon offered and Mr. Cuntz seconded a motion that the secretary be instructed to transmit a letter to Hosea Webster expressing the sympathy of the association upon the death of his wife.

The question of the proper method of handling funds received and disbursed by the Alumni Day Committee and other committees of the association was considered, and on motion of Mr. Post, seconded by Mr. Gubelman, the matter was referred, with power to act, to the committee already appointed to consider the secretary's salary, etc.

The Executive Committee met in New York City at the Railroad Club on Wednesday, May 14, 1913. President Peabody called the meeting to order at 1 p. m. and the secretary noted the following members present: E. H. Peabody, J. H. Cuntz, F. J. Gubelman, J. A. Dixon, W. E. S. Strong, H. E. Griswold, L. A. Martin, Jr., R. W. Pryor, Jr., and T. C. Stephens; also the following past-presidents: Dr. Alexander C. Humphreys, William Kent, R. S. Kursheedt, George Dinkel and H. S. Morton; and the managing editor of the Indicator, G. E. Terwilliger.

After the reading and approval of the minutes of the previous meeting of April 9, Mr. Peabody reported progress on behalf of the Alumni Day Committee and Mr. Cuntz was called upon to report for the committee appointed at that meeting to consider the secretary's salary and other financial and administrative details connected with the officers of the secretary and treasurer, the management of the Indicator and of the various sub-committees. He reported that the committee had decided that beginning July 1, 1913 the Secretary should receive an honorarium of $200 a year and that the honorarium of $100 to the Treasurer be continued as heretofore; also to employ a stenographer to take care of all clerical work connected with the various officers, the Executive Committee, and the management of the Indicator at a salary of $600 a year, of which the management of the Indicator agreed to pay $150. The committee recommended that a system of vouchers upon which the treasurer would issue checks, be adopted by the management of the Indicator, and that all funds collected by the various committees be transmitted to the treasurer and be disbursed by him upon order of the respective committees. It was moved by Mr. Griswold and seconded by Mr. Dixon that the report be adopted and placed on file. Unanimously carried.

Mr. Peabody, speaking of the falling off in attendance at the college, said that some active step should be taken to remedy this and asked Doctor Humphreys to explain the situation. Doctor Humphreys attributed the immediate cause of the small number of students to the increase in tuition fees and urged the necessity of interesting the alumni in obtaining the right material for prospective students. He told of the desirability of obtaining men from various parts of the country, which would result in an interchange and broadening of ideas as well as helping to

spread the fame of Stevens and of how the alumni of other colleges, teaching in preparatory schools, would go even to extremes to send men to their colleges. The present equipment, Dr. Humphreys stated, could take care of about 150 in the Freshman class, whereas the actual admissions were only about 100, chosen from less than 200 applicants. This question of attendance, he suggested be taken up at a joint meeting of the Alumni Publicity Committee and the Faculty Publicity Committee. It was so moved, seconded and carried.

Mr. Gubelman suggested that it might be found expedient to consolidate the two committees.

Reporting for the committee appointed to consider the adoption of a uniform letter-head for all branches of the organization, Mr. Stephens said that the committee was not in favor of using a letter-head uniform with that adopted by the college, but that being a separate and distinct organization, it was deemed advisable to have a distinct letter-head; and also, that the letter-head for the INDICATOR management should be different from that of either the Alumni Association or the college. It did advise, however, that the letter-heads for all officers and subcommittees of the Association have a uniform main caption, preferably "Old English," the name of the particular office or committee being placed below this and to the left in "Antique." Moved and seconded to adopt report and carried.

Professor Martin read his treasurer's report, showing a balance to date of about $348 and stated that the estimated budget to the end of the fiscal year was about $200 leaving a balance of somewhat over $100 in the treasury at the end of the year. It was moved by Mr. Strong and seconded by Mr. Dixon to accept the report. Carried.

Mr. Dixon, for the membership committee, made the usual motions that Albert W. Erdman, '91, E. B. Smith, '98, M. J. Weichert, '96 and Hubert S. Wynkoop, '88, be reinstated to active membership and that the names of Jerome D. Gedney, ex '96 and Wessels Van Blarcom, ex '93, be presented at the annual meeting for election to associate membership. Seconded by Mr. Griswold and carried.

The secretary then read the names of men who had been reinstated by the Executive Committee or elected to membership during the year 1912 but had not qualified by the payment of dues, in some instances not having received bills, and asked instructions as to the method of procedure in these cases. Upon a motion by Mr. Gubelman, which was seconded by Mr. Cuntz and carried, the Secretary was instructed to notify these men that their dues for the current year would be remitted and upon their paying the proper amount for the ensuing year, they would immediately be placed upon the rolls as members in good standing. Taking up the resignations of E. G. Seaman, '93 and B. H. Jackson, '95, which had been laid on the table at the meetings of December 4, 1911, and April 3, 1912, respectively, a motion was carried to refer the cases of these men to their class representatives.

Mr. Griswold reported for the Southern Alumni Letter Committee that after considering the matter they considered it undesirable to seek financial aid from the New Jersey State Legislature at the present time and recommended that the committee be discharged. Mr. Strong so moved, with the thanks of the Association. Seconded by Mr. Dixon and carried.

Mr. Terwilliger told of the proceedings of the Brooklyn Club dinner held at Castle Stevens on the evening of May 7 and the plan put forth that night for the affiliation of the Stevens clubs. He stated the Brooklyn club had appointed a committee to confer with the officials of the Alumni Association as to the best method of bringing this about. At the suggestion of Mr. Cuntz a motion was made and carried that a committee be appointed to confer with the above mentioned committee of the Brooklyn club. The chair named Messrs. Cuntz, Dixon, Stephens and Peabody, *ex-officio*.

The report of the Stevens Luncheon Committee was rendered by Mr. Kursheedt, accepted with the thanks of the Association and a motion made to continue the committee until next fall. Mr. Kursheedt reported that the luncheon had been a great success as a beginning, there being thirty-five present. Regrets were received from forty.

A letter was read from Mr. Boucher, giving the dates of the Civil Engineering Society and expressing the hope that the dates of Stevens activities could be so arranged as not to conflict with these. The secretary was instructed to write to the most important engineering societies for their calendars of dates with a view of preparing a Stevens calendar that would not conflict.

A special meeting of the Executive Committee of the Alumni Association was held at Castle Stevens on Saturday, May 24, 1913 for the purpose of canvassing the ballots cast at the annual election of the Association. The meeting was called to order at 5:30 p. m. by President E. H. Peabody, the other members present being J. H. Cuntz, Walter Kidde, L. A. Martin, Jr., R. W. Pryor, Jr., T. C. Stephens, and George Dinkel, past-president of the Association.

The reading of the minutes of the previous meeting was dispensed with and the count of the 400 ballots cast, out of which twenty were barred from voting as defective, taken up with the following result:

	Votes
For President, John Henry Cuntz, '87	380
1st Vice-President, J. Alfred Dixon, '91	380
2nd Vice-President, Wm. E. S. Strong, '92	379
Secretary, Gustav G. Freygang, '09	379
Treasurer, Louis A. Martin, Jr., '00	380
For Directors:	
John S. DeHart, Jr., '09	346
Fred A. Muschenheim, '91	297
Chas. H. McCullough, Jr., '91	254
Fred. W. Cohen, '92	107
Frank E. Law, '92	183
Thos. C. Stephens, '00	148
David C. Johnson, '06	115

The four directors elected being Messrs. DeHart, Muschenheim, McCullough and Law.

For Alumni Trustee the candidates in the order of the vote cast for them were Messrs. Ernest H. Peabody, '90, Richard H. Rice, '85 and Roland S. Kurshecdt, '80.

It was moved by Mr. Kidde and seconded by Mr. Pryor that those elected be announced at the Annual Meeting and published in the INDICATOR, the order of the vote on Alumni Trustee to be forwarded to the Board of Trustees and the President of the Stevens Institute of Technology. Carried.

On Wednesday evening, June 4, 1913 a meeting of the Executive Committee was held at Castle Stevens, Hoboken, N. J., being called to order at 8 p. m. by President E. H. Peabody, J. H. Cuntz, F. J. Gubelman, J. A. Dixon, Walter Kidde, R. C. Post, L. A. Martin, Jr., R. W. Pryor, Jr., and T. C. Stephens were the other members present, while the following past-presidents of the Association: Dr. Alexander C. Humphreys, Messrs, R. S. Kursheedt, R. M. Anderson and Henry Torrance, Jr., were also present, and G. G. Freygang, secretary-elect, attended by invitation.

As a copy of the minutes of the last regular meeting of May 14 had been sent to each member, the reading of the same was dispensed with, but the minutes of the special meeting held May 24, 1913 for the purpose of counting the ballots of the Association's annual election, were read. Upon motion of Mr. Dixon, seconded by Mr. Kidde, the minutes of both meetings were approved.

Mr. Stephens then rendered his report as secretary, calling attention to the fact that that office was handicapped by the obsolete method of filing addresses and addressing mail and recommending that the cumbersome rubber-type addressograph now used be discarded in favor of a stencil system, filed as a card index, the stencils being cut on an ordinary typewriter.

He advocated that when reply-cards are sent out for addresses by any department a request be made for both business and residence address, to specify which address is preferred for mail and to "O. K." if such card has been correctly addressed, thereby saving much unnecessary address changing on the files.

In connection with publicity, Mr. Stephens said that the office of the secretary might be used to advantage as a clearing house for information to be exchanged among the various clubs, branch associations, class representatives, the INDICATOR, the *Stute*, the Publicity Committee and the Excutive Committee, by means of copies of letters dealing with the activities of the above and any important news concerning individual alumni. Also that, if this were done, it would help materially to bind the alumni closer together and serve to spread the fame of Stevens and to spur the various organizations to renewed activity. The secretary's office might be of assistance also, should it be deemed expedient to compile an individual history and record of each alumnus, but only provided that the time of the clerical help employed at present be devoted exclusively to the Association and the INDICATOR and be not needlessly taken up by cumbersome systems.

At the conclusion of the report Mr. Post moved that it be accepted and that the Association make an appropriation not to exceed $180 to purchase a stencil addressing machine and the necessary accessories as described by Mr. Stephens. This was seconded and, after discussion, carried unanimously. The chair appointed

Messrs. Stephens, Gubelman and Kidde as a committee to attend to the purchase of the machine and the arranging of the details of the system.

The Committee on Increase of Membership presented the following men for reinstatement to active membership: C. J. Everett, '90, A. G. Kollstede, '94, K. S. Littlejohn, '98, R. J. Decker, '99, and the usual motion was made and carried so reinstating them. Also the names of the following: Dr. Edward D. Rudderow, ex '93, John D. Lobb, ex '08, Harold A. Brangs, ex '09, were offered for consideration as associate members and the name of J. F. Haworth, '90, for active membership, their names to be presented at the annual meeting for election. A motion to recommend these men for election was carried.

Mr. Gubelman reported for the Publicity Committee, reading a letter from the Faculty Publicity Committee regarding means of acquainting men with the desirability of taking the course at Stevens. The report was accepted and the committee continued, Mr. Cuntz moving that a joint meeting of the committee be held with the Faculty Publicity Committee at the earliest practicable moment for the purpose of devising a plan of coöperation. It was seconded and carried.

Mr. Cuntz told of the coming meeting of representatives from the Stevens clubs and of their plans for consolidation.

A Stevens calendar to be sent to all the alumni, containing the dates of future events and illustrated with views of past events, and the like, was suggested by Mr. Kidde.

It was moved by Mr. Cuntz and seconded by Mr. Dixon that the members of the senior class be elected to membership in the Association with the proviso that they should not be entitled to the privileges of active membership until they had signed their applications for such membership and received their degrees. This was carried unanimously and the secretary was instructed to write to the president of the senior class notifying him to that effect and inviting the class to attend the annual meeting.

At the suggestion of Mr. Peabody, the Executive Committee tended Mr. Stephens a unanimous vote of thanks for his work as secretary during the past six months.

There being no further business before the committee, Mr. Peabody called attention to the fact that this was the last regular meeting of the committee before the change in administration, and said that he wished to express his appreciation of the support which the committee had accorded him during the year's work and the interest and enthusiasm they had displayed in the cause of Stevens.

Mr. Cuntz here arose and said that in view of the excellent, untiring and energetic administration of the Association's retiring president he thought it fitting to propose a rising vote of thanks to Mr. Peabody as a token of the Association's and Executive Committee's appreciation of his services. Mr. Stephens seconded the motion and it was carried unanimously.

TRUSTEES OF THE ALUMNI ASSOCIATION.

The Trustees of the Alumni Association met at Castle Stevens on June 4, 1913 and ratified the proceedings of the Executive Committee at its meetings held February 4, March 12, April 9, May 14 and May 24, 1913. Present were: E. H. Peabody, J. A. Dixon, Walter Kidde and R. W. Pryor, Jr.

ALUMNI NEWS

TWENTIETH BIRTHDAY OF 1893

The Class of 1893 held its Twentieth Anniversary Banquet at the Hotel Astor in New York on the evening of April 25. In anticipation of a royal good time—and they were in no wise disappointed—22 members of the Class responded to the call to dinner, one coming from far away North Carolina and several others from distant states to be heartily welcomed by the New York contingent after an absence of two decades. The company sat down to table in the yacht room of the hotel and proceeded to enjoy themselves in the whole-souled manner of students of other days. The average weight of the Class was ascertained to be 175.3 pounds, the scales being fractured at 296 pounds by the successful claimant for the prize. All but two of those present proved to be benedicts and one proudly pointed to his record of five girls and a future candidate for Stevens.

A handsome loving cup was presented to and gratefully received by the Class Secretary for his twenty years' service.

Before parting, the Dinner Committee was warmly praised for the success of its efforts and all joined in vowing that they would return five years hence to celebrate the rounding of its quarter-century mile post by the Class.

1909 DINNER AT THE CASTLE

On Tuesday, May 6, the Class of 1909 held a well-attended reunion dinner at Castle Stevens. Plans were discussed for Alumni Day, and a vote authorized to be taken by secret mail ballot to ascertain the average income of members of the class resulting from their own efforts next June, when they will have been graduated just five years.

MICHIGAN STEVENS MEN MEET

The second quarterly meeting of the Michigan Stevens Club was held on June 28, at the home of Austin Church, '95, at Trenton, Mich. There was a good attendance of members and several incidents of note, including the fact that R. S. Lane, '08, was precipitated from Mr. Church's motor boat into the green waters of the river, and E. T. Birdsall, '86, president of the club, was held up on the way for speeding in his new auto.

FIRST REUNION OF 1912

The Class of 1912 held its first reunion dinner at Castle Stevens on the evening of Friday, May 9. Twenty-four men were present. Whitley

acted as toastmaster, introducing as speakers, Hess, Dempwolf, Ross, Schwarz, Carter and Breithoupt. Plans were discussed for the "Dungeon Room," which 1912 is to build at the Castle in conjunction with the Class of 1902, at an estimated cost of $1,500. The room is to be situated in the basement, and will be used particularly for class dinners and the like. The committee in charge of the dinner comprised Lasker, Schwarz and MacNabb.

NEWS OF THE COLLEGE

SPRING ATHLETICS

The spring athletic season was far from the success that was looked for at its beginning, but much good material is available for next year's campaign. The tennis team won four matches, tied one and lost one. The track team defeated New York University, $54\frac{1}{2}$ to $46\frac{1}{2}$, and lost to Rutgers, $67\frac{1}{2}$ to $37\frac{1}{2}$. The detailed baseball, lacrosse and tennis records follow:

Baseball

March 29—Stevens	0	Fordham	7
April 2—Stevens	1	Army	10
April 5—Stevens	1	Lehigh	9
April 9—Stevens	9	C. C. N. Y.	2
April 19—Stevens	0	Lafayette	10
April 21—Stevens	1	Princeton	16
April 25—Stevens	9	Union	0
April 26—Stevens	4	Rensselaer	6
April 30—Stevens	1	N. Y. U.	4
May 3—Stevens	1	Crescents	13
May 7—Stevens	3	Rutgers	5
May 10—Stevens	5	Delaware	14
May 18—Stevens	5	Swarthmore	7
May 30—Stevens	0	Commonwealth	4
May 31—Stevens	2	Montclair F. C.	3
June 10—Stevens	4	Rutgers	2
June 14—Stevens	1	Rutgers	16

Lacrosse

April 5—Stevens	3	Crescents	8
April 12—Stevens	0	Johns Hopkins	11
Aprll 19—Stevens	3	Swarthmore	7
April 26—Stevens	3	Harvard	9
May 2—Stevens	0	Cornell	5
May 3—Stevens	11	U. of P.	1
May 10—Stevens	1	Lehigh	9
May 24—Stevens	10	Hobart	2
May 30—Stevens	0	Harvard	4

TENNIS

May	3—Stevens	6	Fordham	0
May	5—Stevens	6	C. C. N. Y.	0
May	10—Stevens	3	N. Y. U.	3
May	14—Stevens	1	Yale	5
May	17—Stevens	6	Rutgers	0
May	31—Stevens	6	Rutgers	0

ENGINEERING SOCIETY DINNER

On May 6 the Stevens Engineering Society held its annual dinner at the Hotel Flanders, New York City. The occasion was most enjoyable, the work of the closing year being reviewed and plans made for the 1913–1914 season. Among the guests were Calvin W. Rice, Dr. F. J. Pond, William Kent and Prof. F. L. Pryor.

DEBATING CLUB FORMED

Early in the spring a debating club was formed, to which all students are eligible. The frequent occasions upon which engineers are required to speak in public makes the organization particularly of value at Stevens, A series of debates is to be arranged during the fall term.

MR. KINSEY HONORED

A. S. Kinsey has been elected a member of the Board of Education of South Orange Township, including the villages of South Orange Maplewood and Hilton, N. J. The term is three years.

FOOTBALL

Fall football practice will begin at Castle Point Field on Monday September 15, under the direction of Coach Fuller. The schedule is follows:

October 4—Army, West Point.
October 11—Haverford, Hoboken.
October 18—R. P. I., Troy.
October 25—Johns Hopkins, Hoboken.
November 1—Delaware College, Hoboken.
November 8—Union, Schenectady.
November 15—Conn. Agri. Col., Hoboken.
November 22—Rutgers, Hoboken.

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SPHERICAL BALLOONS*

By R. H. Upson, '10

THE Goodyear Tire & Rubber Company is turning its attention to three principal lines of aëronautic development; aëroplane accessories, spherical balloons and dirigibles. Although I realize that aëroplane accessories and dirigibles might be of more interest to most of you, I welcome the opportunity to talk on spherical balloons, first, because you are probably less familiar with ballooning; second, because it is a subject whose importance I firmly believe has never been fully realized in this country.

Six years ago when the aëroplane first began to attract attention by its successful performances it was asserted by many that the real conquest of the air had at last arrived and that the old-fashioned balloon would speedily become extinct. I can show by a few figures about how much the spherical balloon has lost by the advent of the aëroplane. As a rough gauge to the general activity in ballooning, I shall take the amount of gas used per year for inflation purposes at the St. Clouds grounds, near Paris. In 1905 just before the aëroplane came into public notice, the total amount of gas used was 276,000 cubic meters. In 1911 it was 773,000 cubic meters. During that year there were 625 ascents made, taking 2,100 passengers, including many

*Lecture delivered before the Aeronautical Society, New York.

women. I have been unable to get the exact figures for 1912, but it is estimated that there were 3,000 balloon flights made in France and 20,000 in Germany during the last year. Thus, old-fashioned ballooning, instead of becoming extinct, as some of our friends would have it, apparently owes much of its strength to the achievements of its so-called competitors.

This situation has a very good parallel in the history of illumination. Not very many years ago candles were about the only source of artificial light that people had. When kerosene lamps and illuminating gas first came to be widely used, one might have thought that candles would soon be forced out of the market. Finally with the introduction of electric lighting, its subsequent improvement and rapidly increasing adoption, one might well think that the gas consumption would drop off correspondingly. But has it? Is there any great drop in the sale of kerosene lamps? Are candles becoming extinct? On the contrary, statistics show that there is more gas, there are more lamps and more candles being used today than ever before. The increase in population explains only a small part of it. The real reason is that the coming of better, more efficient illuminants has so increased the general desire for illumination that even the older and cruder forms have been carried along in the same great wave. Incidentally each form has found uses of its own which, though less comprehensive, owing to the presence of the others, are no less important.

There are many other examples of a similar nature. Photography and painting, phonograph and piano, telephone and telegraph, steamboat and sailing ship, steam power and water power may be mentioned. This course does not always hold, as is witnessed by the automobile and horse, but it seems to be a very ordinary result. Thus, the aëroplane is not a competitor but an ally of the balloon. The achievements of aviation have merely stimulated inter-

est in ballooning, not only with the general public, but among constructors and inventors who are trying to raise its standard of quality.

Granting that the spherical balloon has retained its hold, even in the presence of aëroplanes and dirigibles, we come to another question which is quite as important. What reason have we for thinking that the present development will continue? In other words, what are the practical uses for a balloon, which justify its existence? We may easily admit that there is no such great economic need for balloons as there was for railroads, for instance. But if a thing, no matter how small, does its fair share toward aiding progress and knowledge, or promoting comfort, it certainly is worthy of our support. I believe the spherical balloon is justified on these grounds. If you will consider now some of its uses I think you will come to the same conclusion.

First, there is the military use. In this it is much simpler for *some* purposes than the aëroplane. A captive balloon may be used for observation, a free balloon for reconnoitering, for dropping explosives, and for carrying messages. One of the principal uses is in the case of a besieged city where a balloon may be of great value to both the besiegers and the besieged. By its means the besiegers may examine the condition of the city and its defenses very effectively. By gauging the wind with a pilot balloon and starting from the windward side a balloon could be made to pass directly over the city and do great damage by dropping explosives. With an ordinary sized balloon, say 80,000 cubic feet, one ton of explosives could be carried and dropped at one time, which would disturb the equilibrium only to the extent of 15,000 feet increase in altitude. A few bullet holes through the gas bag would in general be insufficient to bring the balloon down before it had done its work. Aëroplanes in this case, as in many others, would be good defensive weapons for the city, but before making extravagant claims for them

in this respect, it should be noted that the balloon would be as fully armed, if not better than the aëroplane, and also that the balloon could be sent up at night when it would be almost impossible to detect it, owing to the entire absence of noise in its operation.

Balloons are also of great value to the besieged in a city, principally for the purpose of carrying messages to the outside world. Every one is probably familiar with the work of the French balloons during the siege of Paris in the Franco-Prussian War. These carried messages out of the city every few days during the siege and carrier pigeons brought back replies.

Another use for balloons is for the study of meteorology. The small rubber balloon for carrying instruments to high altitudes is a practical necessity in the exploration of the upper atmosphere. But a man-carrying balloon has great advantages at all ordinary heights. Here the pilot can vary his altitude at will, direct his course to a certain extent, and, above all, apply the factor of human intelligence at the point where it is most needed, insuring a variety of observations which are impossible otherwise, even with the best of instruments. The mere contact with the upper air is a great teacher. Thus you will find almost without exception that an experienced balloonist, even without effort on his part, is also well versed in meteorology. The effect is much the same as that of a sail-boat upon its navigator, the principal difference being that the sail-boat is confined to two dimensions while the balloon may roam through all three.

This brings us to a third use for balloons which in one sense includes the first two, namely, that it furnishes training for the development of other and more advanced forms of aërial transportation. Aside from the military and meteorological aspects, this training is of special value in the case of dirigibles. The dirigible itself is primarily a balloon and is subject to many of the same laws that apply to a spherical.

Thus among materials of construction, fabric, valves, cordage, gas and others have been and will be benefited by experience with spherical balloons.

I have already referred to a captive balloon for military purposes. Another use, with which you are, of course, familiar, is for amusement enterprises. A large captive balloon carrying twenty or thirty persons is a well-known feature of nearly all world's fairs.

Finally we come to two uses for spherical balloons which will probably be most important in the years to come, namely, for advertising and for sport. I shall postpone the discussion of these for the moment to go briefly into the methods of construction.

The most important material in the construction of a balloon is the fabric. This may be either rubberized or treated with other materials, such as varnish.

Rubber has the advantage of being durable, permanently gas-tight, and pleasant to handle, properties which so far have not been shown to any great extent by varnished balloons. Rubber, however, has the disadvantage of being more expensive.

The ordinary rubberized balloon fabric is made of two plies of cloth with rubber between, and often on one or both surfaces as well. One ply of cloth is generally laid on the bias, which makes the fabric very tough and hard to tear. There are many problems involved in the actual construction, most of which are capable of strict mathematical analysis.

I won't waste your time by trying to expound the principle of Archimedes and explain why a balloon rises. Suffice to say, that there is a gas within the balloon of lower density than the outside air. The pressure of gas in a balloon is zero at the bottom, where it comes in contact with the air, but the pressure increases as we go up into the balloon in the same way that water pressure increases with depth.

For this reason, if we have a balloon surface which is perfectly flexible in all directions, it will not take the form of a sphere, but a peculiar curve always more or less pear-shaped, but different for every different set of conditions. With a properly designed net, however, the natural curve may be made very nearly spherical and the fabric may then be given sufficient margin of strength to make the balloon literally spherical. In this form it is easier to make, presents a better appearance, and in a moderate sized balloon no extra weight is necessary. This principle must be applied with considerable caution, however, and always with due allowance for stretching of the fabric and the weight of the valve, or, instead of a sphere, your balloon will assume a kind of pumpkin shape which is very often met.

An ordinary balloon envelope is built out of horizontal blocks of fabric. These are generally alternated like bricks, but recently many balloons have been made with the blocks laid straight above each other as it is found that a better surface can be obtained in this way. For all ordinary widths of cloth the blocks should be made of such a size that the combined cost of labor and material is a minimum. Hence it would be absurd to use the same size block for all different sizes and kinds of balloons. It may vary even in balloons of the same size and material; for instance, the design best adapted to French manufacture is not at all the best for this country, owing to the comparatively high cost of labor.

The strength, lightness and tightness of fabrics are the objects of much experimentation. It is impossible to make a balloon absolutely tight against leakage, but this may be reduced to almost any desired figure. A good "free" balloon, of say 40,000 cubic feet, should show a total leakage of less than would escape through a single hole one-sixteenth inch in diameter. It is often desirable to make it much lower still in the case of captive balloons. The leakage through valves is an important item which is often overlooked. I have seen old

experienced aëronauts using valves which leaked over 100 times as much gas as escaped through all the rest of the balloon. The seams must, of course, be made over 100 per cent efficient, both as to strength and tightness.

The resistance of the fabric to conduction and radiation of heat is another very important study which I shall touch upon a little later.

I wish I had time for more about the construction: the different kinds of valves, the wonderful and peculiar properties of balloon nets, the stresses occurring throughout the balloon. However, from what has been said, you will probably see that safety, in other words, sufficient strength, is about the only prime requisite. The other qualities, lightness, tightness, durability, resistance to heating, cheapness, and the rest, are largely so interrelated with each other that the main problem in the design is to get such a combination as will provide maximum efficiency for the whole.

A free balloon is controlled, as you all know, by the means of gas and ballast; that is, a certain amount of reserve weight is carried, called ballast, which is lifted by a corresponding reserve of gas. In order to ascend or to check a descending impulse, ballast is thrown overboard. To accomplish the reverse, gas is released. The latter process is largely automatic so that generally the valve does not have to be used at all until the landing is to be made. It is mainly this alternate loss of gas and ballast which finally terminates a balloon flight; and the principal cause of this sacrifice is the heating of the gas by the sun's rays.

When the sunlight passes through any surface, a certain amount of the radiant energy is transformed into heat and in the case of a balloon is imprisoned within, where it acts to raise the temperature of the gas. When the temperature reaches a certain point, enough heat is lost by outward conduction through the fabric to balance that received by radiation, and the temperature has then reached a maximum.

This temperature is sometimes found in a varnished balloon to be as much as 90° F. higher than the outside air.

The temperature itself doesn't cause much trouble, but change in temperature does and this is always occurring throughout the day, even in cloudy weather, from the constantly varying radiation from the sun. An increase in temperature, of course, causes the gas to expand, thereby driving out the air or gas which happens to be at the bottom of the balloon. Whether it is air or gas, the loss of weight is like the loss of much ballast and causes the balloon to rise. The rise is much more marked if there is air in the bottom of the balloon, and in this case it usually persists until all the air has been forced out. This is bound to occur sooner or later, however, so that a rising impulse always automatically checks itself in time.

Not so with a cooling or descending impulse, however. There is no limit to the amount of air that can be sucked in, so that even a slight descending impulse may often carry a balloon clear to the ground if ballast is not thrown out to stop it. Atmospheric conditions may be generally found, however, at certain heights where the equilibrium of the balloon is essentially stable in both directions. This occurs when the temperature gradient of the air in a downward direction is less than that which would result from the adiabatic contraction of a descending particle.

It is the aim of a skillful balloonist to find these atmospheric conditions and take advantage of them, and also to find wind currents which take him where he wants to go; and even, failing in these, to use his ballast in such a judicious way that it will last him the longest possible time.

The pilot has at his service various instruments which are a great aid in attaining these ends. The barograph makes a record of the height on a piece of paper. The thermograph records the temperature; the animoscope tells whether he is going up or down through the air; the stati-

scope whether up or down relative to the ground. The variometer gives the exact speed of such rising and falling. The balloon-compass, an ingenious instrument devised by our German friends, gives the speed and direction of flight in a horizontal direction.

But even the most skillful aëronauts with the best of instruments can do little against unusually adverse weather conditions. It is this element of chance and uncertainty which I regard as the most attractive feature of ballooning. It is a great game which any one may play and a few play well; but it is not a game like chess, where nearly all depends upon the skill of the player. It is more like bridge, where each man must make the best of the cards he gets, whether they be good or bad. Thus it is in a balloon race that even the poorest and most inexperienced has a chance to win if he holds the right cards.

But please do not think that when I say element of chance I mean danger. Ballooning is actually one of the safest sports known. Statistics show that less than one-half of one per cent of the persons making flights are injured in any way, and the fatalities are so rare as to be almost negligible. It is, of course, easy to take risks in a balloon, for instance, by staying up through a severe storm, but it is also very easy to see the approach of a storm in time to make a good landing. A man doesn't take such risks if he is merely out for pleasure or in charge of passengers. A fatality in a balloon full of passengers is, as far as I am aware, absolutely unknown.

The use of a small captive balloon for advertising is comparatively new, but promises great things. A captive balloon used to be a very complicated and cumbersome affair and wholly unsuited for commercial use. For instance, it is stated in a recent work on military aëronautics that a small captive balloon (about 15,000 cubic feet) requires a detachment of three officers and forty-five men to operate it. But

now that such a balloon shows signs of commercial utility, a type has been developed which can be operated almost entirely by one man.

It might be said that an advertising balloon is attractive principally on account of its novelty, and that consequently its use would not be permanent. I think that view is wrong. A balloon has certain inherent qualities which are bound to attract attention, no matter how old or commonplace. It is conspicuously isolated. It has no competitors in its own field. It is always moving, always changing. Even the most complicated electric sign has a certain cycle of changes; but a balloon never moves the same way twice and is an unfailing source of interest to all who see it. And the expense? It is generally less than that of a first-class electric sign of similar size.

I believe the spherical balloon is here to stay. It does not promise astounding development for the future, but it has qualities of permanency which cannot be disregarded. Some day aëroplanes and dirigibles may darken the sky, but the spherical balloon bids fair to remain the best of advertisers and the King of Sports.

DEPRECIATION: ESTIMATED AND ACTUAL*

By Alex. C. Humphreys, '81, M. E., Sc. D., LL.D.

THE American Gas Institute having accepted the gracious invitation of the Institution of Gas Engineers to present a paper at this meeting, which is intended particularly to celebrate its fiftieth anniversary, I have been designated to represent the sister society for this service. I appreciate the honor thus conferred; and this sense of appreciation finds emphasis in the fact that my long-time friend, Sir Corbet Woodall, is the Institution's President this Jubilee year.

I have chosen as my subject "Depreciation," so-called. This is a subject of importance to the owners and managers of all industrial properties. It is of particular importance to the owners and managers of public service properties. In connection with rate-making cases before commissions and courts, it is of vital importance to-day to the owners and managers of public service properties in the United States. Within the limits of a single paper—perhaps extended beyond the bounds suggested by a kindly forbearance—I cannot hope to meet satisfactorily all the many and complex questions which have come to be included or involved in the ambiguous term "Depreciation." Certainly, as used in the United States the term is not self-explanatory. This inability on the part of those discussing moot questions to agree upon the meaning of terms and forms of expression is at all times a fruitful source of otherwise unnecessary disagreement. Perhaps this is particularly in evidence in

* Reprinted from the Transactions of the Institution of Gas Engineers (Great Britain), 1913.

the United States. I know in advance, therefore, that, through one cause or another, partly on account of the magnitude of the subject and my inability to give adequate expression to my views within the limits required, I shall not now succeed in avoiding all misunderstanding.

Necessarily, what I have to say is of more direct interest to an American audience. But part of what follows should be of interest to all owners and managers of public service properties; and in view of the fact that there is no inconsiderable amount of British capital invested in American public service properties, this discussion may be found to be of direct interest to many on your side of the Atlantic. In view of the spirit of unrest which is now in evidence all over the civilized world, and the readiness with which additional laws are placed upon the statute books of the United States, it is of the utmost importance that those who are responsible for these properties should be more nearly in agreement as to the most effective lines to be followed in their honest efforts to secure full protection for the investments entrusted to them.

If the many and complex questions involved in depreciation are to be solved so as to do justice both to the investor and the purchaser of service, there is required on the part of all concerned the most competent, comprehensive, and judicial study and treatment. While this responsibility must rest upon all who can or do exercise influence in the settlement of these questions, particularly must the responsibility rest upon the lawyers and experts representing the companies. In certain cases these representatives of legitimately invested capital have not sufficiently mastered the questions involved to qualify them to meet effectively their great responsibilities. This is peculiarly a cause for concern because the commissions and courts have of late years had thrust upon them for adjudication many novel questions; and so they need at our hands all that we can furnish as to

general theory and special conditions. Here it is necessary to distinguish between hypothesis and theory. The theories adopted must include all the accepted teachings of experience.

While looking and hoping for, and confidently expecting, such a revision of public opinion as will give the public service corporations more even-handed justice than has been indicated of late in certain cases, this hope and expectation should rest upon the determination on the part of those most directly concerned to do all that is legitimate and straightforward to this end. Certainly it is the duty as well as the best policy of the representatives of the companies to be frank in their statements of fact and bold in the presentation of their opinions, provided those opinions have been formed with the rights of all in mind.

We must believe that, in the great majority of cases, the commissions and courts are doing their best, as far as time and training permit, to arrive at just decisions. But without wishing to express disrespect for our commissions and courts, certainly we must not be too ready to accept their opinions as the final word on any technical question. Some of our lawyers and experts are too ready to accept court opinions and decisions as final. The fact that on any of the questions we have to consider we can find court opinions varying through a wide range should furnish a sufficient corrective to this subserviency of mind. Certainly we should constantly keep in mind that, at least on many of the technical questions involved, we engineers are more competent to form a correct judgment than are the lawyers or judges.

For instance, I am not prepared to change my opinion as to the strength of cast-iron pipe as ordinarily used for the distribution of gas because the late Justice Peckham, of the Supreme Court of the United States, in handing down the unanimous decision of that court, in the celebrated New York Consolidated Gas Company's case, included in his

opinion the statement that one feature of the law under consideration could not be enforced against the company because a pressure measured by a column of water $2\frac{1}{2}$ inches high would burst the cast-iron pipes used to convey the gas.

This may be taken as an exceptional error. But this case of the Consolidated Gas Company was one of vital importance to our public service corporations and we may assume that it received the most careful attention of the Judge to whom was assigned the duty of making the more specific study of the evidence and of writing the opinion of the court. Judge Peckham was an able judge and a fair man, and yet he made an error which an illiterate but specifically trained foreman of a street gang could not have made. If Judge Peckham could make such an error, why should we blindly accept the opinions of commissioners and judges simply by reason of their official position?

Are we not further warned against a too subservient attitude of mind in this connection when we find our commissions and courts holding widely different opinions on what appear to be comparatively simple points of law? Where there is a direct question stated with all the facts arrayed on both sides, I see no reason why the engineer is not as competent to express a sane opinion on the law as a judge or lawyer is competent to express a correct judgment on some technical question in engineering or accounting. I feel quite sure that in many such cases I could do as well on the law questions as Judge Peckham did on the question of the strength of the ordinary cast-iron pipe.

I could cite many other cases to support this proposition. I have in mind a statement presented over the signature of the chief statistician of one of our most influential state public service commissions, in which nearly a million dollars was deducted from the operating expenses of a certain company because the money was paid for taxes. Those of us

who have to supply from income the money to meet the tax collector's claim will find little comfort in the statement of commission or court that this item of cost is a "fixed charge," and, therefore, something different from the other items of cost—such as wages, salaries, coal, etc. I do not find that this classification assists me to pay the bill or to reduce the cost per 1,000 cubic feet of the gas sold.

Much of the error to be found in the opinions and decisions of the commissions and courts is due to the acceptance of hypotheses as theories, which fail to meet the definition of theory because they exclude the necessary limitations of practice. One reason for misunderstanding in connection with depreciation, so-called, is that some of those charged with responsibility fail to appreciate, either wholly or in part, that the questions involved are not the same in the case of a so-called monopoly, subject to governmental regulation, as in the case of a commercial undertaking engaged in an avowedly competitive business, and which only has to reckon in this connection with its owners. This statement is not to be misinterpreted by those who, through ignorance, are ready to discover dishonest motives actuating those dealing with the public.

To take a simple example: In a close corporation engaged in a competitive business, the managers of which are liable only to their own stockholders, it may be considered right and wise to distribute only a portion of the net profits and to apply, wholly or in part, the surplus profits, particularly in extra prosperous years, to writing down the plant account. In the past this has been regarded as conservative practice. Even though the proprietors received no additional stock to represent the increase in assets, they knew that their proportional shares in the ownership of the property remained unchanged. But to get a fair return on the full investment, the dividends were necessarily based upon what appeared to those uninformed as an excessive dividend

rate. The fact that the plant and business had been extended by the investment of earnings—the dividends paid as averages through the years probably having been moderate—does not in any way vitiate the ownership of the stockholders in these extensions. If all the net profits had been distributed to the stockholders, and then the additional capital as required had been handed back to the company in payment for additional stock, the facts would not be changed. Yet by this last method there could have been no question as to the rights of the stockholders.

In the case of public service corporations whose rates of charge are subject to regulation, however, this practice raises questions, and so subjects the stockholders to unnecessary hazard. In the state of Massachusetts, this practice of writing down plant account—charging extensions against income and also debiting lump sums to loss and gain and crediting plant account—has been much in evidence. This was to be expected from the generally conservative tendencies in New England. The state of Massachusetts was the first to place its gas companies under the supervision or control of a commission. This commission was not given the powers that are now conferred upon our state commissions; but it exercised a very restrictive influence as to stock and bond issues and rates of return, and its decisions in this connection have not been notable for consistency. The case is made harder for the stockholders because the law of this state prohibits stock dividends to cover surplus earned.

The effect of this writing down of the Massachusetts companies is at once apparent by a study of the annual reports of the Commission of Gas and Electricity. These companies, instead of showing "watered" stock, show a total capitalization which does not represent the structural value of the plants, to say nothing of certain overhead charges and "going value." One of these companies shows a capital which is equal only to 35 cents per 1,000 cubic feet

of annual sales. If we add to the capital stock as issued the "notes payable" issued to cover *part* of the extensions and for which the company may hope to be allowed to issue stock, the total is only $1.64 per 1,000 cubic feet of annual sales. The cost to reproduce the plant and business of this company would exceed $5 per 1,000 cubic feet of annual sales.

In a case recently decided by this commission, the gas company involved (Attleboro) had been paying 12 per cent. dividends on a capital which was equal to $1.10 per 1,000 cubic feet of annual sales. The commission in its opinion says: "Its capital, in proportion to its business, ranks lowest of the gas companies in the state." This company had no "notes payable" against extensions; so presumably the commission took this into account in making the comparison with other companies, and particularly the company to which I first referred. But notwithstanding the company was paying only 12 per cent. on its capital as issued, which would have been about 2.6 per cent. on a capital equal to $5 per 1,000 cubic feet of annual sales, the commission reduced the price of gas, at the same time enunciating certain rules which clearly must operate to confiscate portions of the company's legitimate investment.

I simply introduce these cases to point out that what may be conservative policy in the matter of writing down plant account to cover "depreciation" in the case of a company managing its own business, it is a fatal error to write down assets below their legitimate investment cost where we are subject to the opinions and control of those who have had insufficient practical experience. It may be easy to understand that the public, in the persons of the consumers, are willing to take something for nothing, but this does not prove that the investor can rightfully be required to accede to such a demand; and if he is so treated he will in the future be slow to furnish capital for new public service under-

takings or for the further development of those already in operation.

Not only does this unscientific and haphazard method of "writing down" of assets work a direct injury to the stockholders of the company involved, but it works an indirect, but very potent, injury to the industry as a whole by furnishing opportunities to the adroit and unscrupulous statisticians to make comparisons which appear convincing on their face but which have no value when analyzed. Unfortunately many such comparisons are accepted on their face in the absence of competent analysis. Here we must not forget that the public and the irresponsible politicians are on the watch for high rates of dividends, without regard to the relation between total legitimate investment and total face value of bonds and stock.

It may create some surprise if I make the statement, as I do, that not a few of our well-established steam railroads have so maintained and so extended and bettered their plants from income that they could not now pay 5 per cent. annually on the reproduction cost of their physical assets alone. I believe this would be true of our railroads taken as a whole. Or we can say that the total par value of the stocks and bonds of all our railroads does not equal the cost to reproduce their physical assets. It is not unlikely that this statement will be received, even in certain quarters in the United States, with doubt and perhaps derision. But I venture to believe that some of our public service commissioners, those competent, fair, and courageous, who might have laughed at this statement a few years ago, would now, as the result of their experiences, be willing to lend it their support.

In our gas and electric rate-fixing cases—in the first instance generally tried before the state public service commissions—we are called upon to meet commission and court decisions which are far from being consistent. In

general, the service rate of charge must be one which allows of a "fair return" (whatever that may mean) upon the "value" (whatever that may mean) of the property "usefully employed." Perhaps the one element which is included in all decisions is the appraised value of the plant. Some courts have defined this as the cost to reproduce new, less "depreciation." This is the dictum which the public service corporations are most generally called upon to face.

Many questions are here introduced as to what constitutes the reproduction cost. Shall the unit prices be those quoted at the time of making the appraisal? As this might work for or against the corporation under fire, it is sometimes suggested that the average prices for the last five or more years should be used. Here there is a fine field for argument, and especially on the part of the experts, lawyers, and others opposed to the public service corporations. A prolific source of debate is the question of pavements over mains. If the mains were laid before the pavements, should the company claim the cost of pavements as adding to the cost to reproduce new? If the company were selling its property, whether the pavements were laid before or after the pipes, the price would be enhanced by reason of the mains being under pavement.

Some commissions and courts include the value for sale of the property as a whole as an element for consideration. Others, like the California Commission, exclude this element from consideration in a rate-fixing case. To be on the safe side the companies must be prepared to meet any and every contention which has received any measure of approval at the hands of any commission or court, no matter how inconsistent these several contentions may be when introduced in the same case. The company may have to face a selection of all the elements least favorable to its case, irrespective of consistency. The opinion of the Massachusetts Commis-

sion in the Attleboro case, recently decided and previously referred to, is notable for its inconsistencies.

There are other items to be considered in the making of an appraisal which are prolific sources of disagreement, either as to their admission or as to their measure, such as preliminary expenses, interest and taxes during construction, omissions and contingencies, engineering, organization during construction, insurance, compensation of general contractor (including his expenses), "going value," etc. Fortunately there is a fairer disposition now in evidence as to the admission of these "overhead charges," though there is still ample room for improvement in the interest of justice to the investor. The Public Service Commission of the Second District of New York has done more than its share in developing sane and fair methods in these and other connections. The Wisconsin Commission also has shown a disposition to be fair and independent in its statements of principles, though it has not always been keen to be guided by the principles so enunciated.

It is not my present purpose to discuss at length these and other items which we have to consider in our rate-fixing cases. I may say, however, that these items, of which depreciation is one of the most important, if not the most important, all things considered, are to-day questions of vital importance to many of our public service companies. I have referred to these matters in the effort to disclose the atmosphere in which we have to fight for justice.

The subject of "depreciation," as connected with the making of appraisals for rate-fixing cases, has been greatly complicated by being involved with the estimates made to cover each year's share of the cost of final renewal or replacement of plant; this to be included as one of the year's items of cost of operation. This estimate is made, and the annual debit to loss and gain and credit to a reserve account are made, solely for the purpose of spreading more evenly

over the years of the plant's service the cost of that portion of maintenance which is not covered by current expenditures for repairs and minor renewals. This estimate of final renewals is supposed to include the elements of physical decay, obsolescence, and inadequacy.

Unfortunately, as I think, we have not infrequently included in this estimate some reserve for extraordinary hazards outside of final renewals. This introduces an unnecessary complication, particularly when it is claimed that the plant has depreciated to an amount represented by the balance to the credit of this depreciation reserve. By segregating the charge for final renewals from contingencies and hazards, we would be in a position to support more effectively our three claims—namely, the inclusion of an annual cost charge to cover final renewals; the inclusion of a reasonable charge for the creation of a limited reserve for contingencies and hazards; and the exclusion of a depreciation deduction from our plant appraisals in rate-fixing cases.

We will assume that the estimate of the annual cost of final renewals of the several parts of plant is made on the basis of a compound interest sinking-fund. The total amount required each year to be charged to loss and gain and credited to reserve will be made up of several amounts required to replace the several parts of plant at the end of the several expectations-of-life which we, in our wisdom or unwisdom, assign to each part of the plant. These parts will be grouped together according to the assigned expectation-of-life. The amount annually required for each group will be the sum which, accumulating at compound interest for the years assigned, will equal the cost of the plant—or the cost less such amount as we believe we can recover in disposing of the displaced parts of plant.

It is thus seen that the total amount credited to reserve each year is the sum of the amounts required for the several

sinking-funds; the number of such sinking-funds being the number of different lengths of life we have assigned to the several parts of plant. This bringing together of the amounts required by these several sinking-funds is convenient in our accounting; but it has led to further complication by bringing into the problem the so-called "average life" of the plant. The use of this term is constantly creating the impression that the plant lives to the term set by the average life and then has to be renewed as a whole. Nothing could be farther from the truth.

To show that in a sinking-fund scheme there is no length of time which is mathematically the average-life, it can be pointed out that this term will vary in length with the rate of interest by which the fund compounds. For instance, I have before me a very simple expectation-of-life table in which there are assumed only five groups of parts of plant as follows: Group "A," 10 years, $25,000; Group "B," 15 years, $50,000; Group "C," 25 years, $100,000; Group "D," 35 years, $150,000; and Group "E," 50 years, $175,000; total, $500,000. The true average-life found by dividing in each case the cost by the expectation-of-life is 28.378 years; whereas the so-called "average-life" for a 2 per cent. sinking-fund would be 28.2 years; for a 4 per cent. sinking-fund, 27.73 years; and for a 6 per cent. sinking-fund, 27.05 years.

To emphasize the point that this average-life should not be allowed to misguide us, and further that the sinking-fund is in fact a collection of sinking-funds, it may well be noted that in the life-table above given the several groups of plant will be renewed within the fifty years which completes the cycle, as follows; Group "A," 5 times; Group "B," 3 1-3 times; Group "C," 2 times; Group "D," 1 3-7 times; and Group "E," 1 time. Here it can be seen that while the term average-life may be convenient for use by those who understand the subject, it may readily lead into error those who have that little knowledge which is so dangerous.

This brings me to three points which must be kept constantly in mind in connection with the study of the problems in depreciation:

1. The depreciation reserve, or, more correctly, reserve for final renewals, is set up for the purpose of spreading the cost of final renewals of parts of plant as uniformly as possible over the periods during which the several parts are expected to render effective service; thus obviating unnecessary fluctuations in cost of operating, and so making it more practicable to keep the rates of dividends as uniform as possible.

2. The amount to be so charged annually to loss and gain and credited to reserve is based upon an estimate or assumption of the effective life of each part of the plant, considering the elements of physical decay, obsolescence, and inadequacy. There is here the opportunity for the exercise of the highest judgment, recognizing the difference between hypothesis and theory and keeping in mind all the limitations of practice. To cover the element of obsolescence, we must know the present state of the art and prophesy as to the future. As to inadequacy, we must estimate as to the future increases in demand for service. As to physical decay, we are limited as to the future by the character of the management, over which we may have no control. Necessarily, then, this estimate is subject to correction. It must be based upon certain assumptions; and these assumptions as to design, construction, operation, and accounting, must control so long as the estimate goes uncorrected. This should mean that the estimate must constantly be open to correction as additional general and specific experience is gained. It should also follow that no tables of averages are applicable to any specific case.

3. The loss will not have to be met until the replacement actually is made. It is an accruing liability against an obligation not yet due. Hence, if we take out the year's

share of the accruing liability, as the payment is not yet due, the fund should receive the benefit of interest accumulations until the time for payment arrives. So far as the plant's capacity for rendering efficient service to the buyer of service is concerned, it by no means follows that the plant has depreciated to the extent of the balance to the credit of the reserve, and that this amount, or any amount, should be deducted from the appraised cost to reproduce the plant new. On the contrary, the fact that such a renewal reserve is being maintained is the strongest argument that all that is possible is being done to provide against impairment of investment and impairment of service efficiency. The liability to renew or replace the plant rests upon the proprietors; and here is the best indication that this liability is recognized and provided for.

Let us now consider a case of appraisal of plant for rate fixing. We will assume that the plant is being maintained in efficient condition through repairs and minor renewals paid for from current income; that final renewals are beng made as required and the cost debited to the final renewal reserve; and that we are debiting each year to loss and gain and crediting to final renewal reserve the amount indicated by the estimate based upon the expectation-of-life of the several groups of plant. Of course, it is to be understood that where reserve is credited on account of liability for future renewals, when those renewals are made the expenditures therefor should be charged against reserve and not against the year's operating expense. I emphasize this point because some have been misled by thinking that we purpose to build up the reserve indefinitely.

Now let us further assume that the appraisal of plant for rate-fixing is in continuous operation, and that depreciation is to be deducted as indicated by our table of expectations-of-life for the several parts of plant, and as advocated, unfortunately, by some commissions and courts, and not

always opposed by those responsible for the protection of investments. The result would be the eventual elimination of all the investment in plant. For as each life group of plant reached the age at which the tables declared it was to be renewed or replaced, the deduction for "accrued depreciation" would equal the original cost. So as each group of parts of plant came to the time for renewal or replacement, that portion of the investment would be deducted from the plant appraisal, and there would be no provision for re-establishing the assets, because expenditures for repairs, renewals, or replacement cannot, as a general proposition, be capitalized.

I say here "as a general proposition." I leave the way open for exceptional cases, such as the rapid and abnormal obsolescence experienced in the development of the electric lighting and electric railway industries. Here the allowed rates of charge for service were not sufficient to pay a "fair return" on the investment and maintain the integrity of the investment. To require the proprietors to meet the total renewal charge in such a case would spell confiscation.

Now let us consider specifically certain questions which are raised in our rate-fixing cases, and which trouble even some of the lawyers and experts appearing for the companies.

Question No. 1: If you are not willing to deduct for "depreciation" in your appraisals of plant, why do you claim the right to include an item for "depreciation" in the cost of gas?

Answer: The income from the operation of the property should first pay all items of operating cost, including administrative charges, taxes, and the maintenance of the integrity of original and supplementary investment. The cost of the final renewals or replacements of plant, as well as the repairs and minor renewals currently made, must, then, be paid for from income. This means that the cost of final re-

newals—or what is usually called estimated, accrued, or theoretical depreciation—is an item to be included first or last in the cost of gas.

As the cost of final renewals does not generally fall evenly on the succeeding years, we may estimate the cost thereof and divide it evenly over the years involved. Unless this is done, the cost for the year or years under examination may be below the average, by reason of the non-inclusion of the year's proportion of cost of final renewals and replacements. Or, it might happen, if there had been expenditures for final renewals or replacements far above the average, that the cost of gas might be unduly high. In either case, the rate of charge would be based upon an incorrect statement of average cost. This serves to explain why some companies are now properly including in their statements of cost an item to cover the cost of final renewals, although they did not include such an item before the days of rate regulation. The mere fact that the effort is made to spread this item of cost over the years involved is no argument one way or the other for a deduction for depreciation in the case of a plant which is being properly maintained and is rendering efficient service. This is a legitimate item of cost; and the item being acknowledged as a charge against income, the liability rests against the proprietors, whether or not a reserve is established, to meet this liability.

This point is well made in a brief on this subject submitted by Charles F. Mathewson, of the New York Bar, in the case of *King's County Lighting Company* v. *The Public Service Commission for the First District of New York.* Mr. Mathewson was the trial lawyer for the company in the celebrated New York Consolidated Gas Company case. The brief now quoted from considers this question chiefly from the legal standpoint. It is the most logical paper on this subject I have ever read. Mr. Mathewson says:

"The proposition [to deduct "accrued depreciation" in

valuing plants in rate-making] is so absurd on its face that it hardly needs discussion to show its fallacy. Why, aside from the question of 'confiscation,' should consumers, for exactly the same service, equally efficiently rendered, expect to pay less in the sixth year than in the first year, merely because some items of plant will (viewed at the sixth year) require replacement at a date in the future then nearer than such date was at the beginning of operation? As well might it be claimed, to repeat a homely illustration, that a farmer should regulate the price of the eggs which he sells, by the age of the hen which lays them—reducing the price of the product as the hen gets on in years. The reason he does not is that the service efficiency and operating value of the hen, as evidenced by the quality of the eggs which she lays, are not impaired by the fact that her life is advancing. That advancement may concern the farmer and possibly concerns the hen; but it in no manner affects the value of the eggs to the consumer, or justifies him in demanding them at a lower price than he paid at an earlier period of her life. The consumer of the eggs must expect to pay a sufficient price to afford a return to the farmer on his total investment in the hen during her life, *plus* enough more to enable the farmer on her death to replace her and thus keep his investment unimpaired. A farmer could hardly be expected to invest in hens for the purpose of supplying the public with eggs, if for a portion of their life he was to receive a return on only a third or a half of his investment; and any such rule would simply compel the public to go without eggs until the regulating power (if such there were) saw fit to revise its reasoning. There is absolutely no difference in the economic principles applicable to the operation of a gas plant and the operation of a hennery, so far as concerns right to return on capital; and what is absurd in one case is equally absurd in the other. The fact that the rate of return in the one case is subject to reas-

onable regulation, and not in the other case, has no bearing on the main proposition."

This question can be further answered by the statement that, if the final renewals were so evenly distributed over the years as to make a practically uniform annual charge, there would be no occasion for a renewal reserve, and there would be no occasion for raising this question. For instance, suppose we bring into the shop for testing and repairing such a number of consumers' meters that the whole number in service is completely overhauled in sequence every five years. Each meter is examined, cleaned, parts repaired or renewed as found necessary, or condemned and replaced by a new meter. The cost of all this work, including the new meters to replace those condemned, is charged each year into the cost of distribution, and so into loss and gain.

Here there would be no need for any additional item to be included in operating cost to cover final renewals of this portion of the plant. The cost of maintenance and final renewals would thus be more accurately distributed over the years than by means of any estimate based upon expectation-of-life. Furthermore, the plant would so be maintained to the highest possible degree of service efficiency. Certain experts of reputation have, unfortunately, taken the position with regard to plant so maintained by approximately uniform renewals that depreciation should be deducted from the appraised cost to reproduce new.

As further examples we may consider the ties of a railroad or the poles of a telegraph company. The assumption has been made that these would have a ten-year life, and that one-tenth of the total number would be replaced each year. Then it has been assumed that the average *age* of these ties or poles will be five years, and so there is a 50 per cent. depreciation which, in a rate-fixing case, must be deducted from the cost to reproduce the plant new. As a question of averages, the statement may be correct. As a

basis for deducting 50 per cent. from the investment in this portion of the plant, it is without the slightest warrant in equity or common sense. This procedure deprives the investor of return upon one-half of his investment in this portion of the plant, and so works confiscation. And this though the utmost that can be done is being done to maintain the service efficiency of the plant! And the service efficiency is the only feature in this connection in which the buyer of service has any just claim for consideration. A certain authority has recently stated that a railroad soon after being put into operation will suffer a depreciation of 15 per cent. and thereafter it can be maintained at 85 per cent. of its original cost by adequate current expenditure for maintenance.

In each of these cases, if there is of necessity a deduction to be made from the original cost to cover "depreciation," a deduction which cannot be avoided by entirely adequate expenditures for replacements, then an amount equal to the deductions for depreciation should be added to the appraisal as one of the necessary items of cost, on the same basis as interest during construction and the many other items other than material and labor, as already mentioned. Certainly there is no reason, under these circumstances, including the maintenance of service efficiency, why the investor should submit to any such wholesale confiscation or to any confiscation, however small.

It may happen that the whole question of "depreciation" may be cared for by the approximately uniform annual expenditures for final renewals. This condition is not infrequently to be found in the case of properties which are scattered over a number of locations, or have been built at different times widely apart. We have such cases in the United States, and I have no doubt there are many in Great Britain.

Question No. 2: Having established a sinking-fund to

cover accruing and accrued depreciation (final renewals), why, in a rate-making case, should you not deduct correspondingly from the reproduction cost (new) of plant?

Answer: Practically this is question No. 1 turned around; but it approaches the difficulty from another point of view.

It has already been shown that the final renewal sinking-fund is established to spread more uniformly over the life of the plant the cost of final renewals of the several parts of the plant. The establishing of the fund indicates a definite purpose to maintain the plant from income, and hence shows that there is no occasion to depreciate the investment in plant. This fund, whether invested in securities or additions to plant, claims its own earnings or interest accumulations to complete the amount required for renewals. Hence its earnings are appropriated in advance as a charge against income, and the fund cannot be taken as an offset to depreciation. If depreciation were deducted, the earnings from this portion of the investment indicated by the depreciation deduction would be eliminated, and so the investment to that extent would be confiscated.

Question No. 3: If plant extensions have been made from the accumulations in the final renewal sinking-fund, why should these additions to plant be included in the inventory of plant to be appraised for a rate-making case, and why should these extensions not be treated as duplications of capital investment?

Answer: This a special case under question No. 2. When the "depreciation" sinking-fund is drawn upon to pay for extensions or betterments, the amount is loaned from the credit balance of "depreciation" reserve, which balance is the accumulation remaining after the payments for the final renewals which have been made against the reserve. Here it is to be remembered that this reserve is being added to annually by the charges to operating cost and interest on accumulations, and is being reduced from time to time as the

parts of plant included in the expectation-of-life table come to be renewed or replaced.

Then all parts of plant which appear in the inventory or appraisal as having been paid for from the depreciation reserve fall in one of two classes:

(1) Parts which have been installed as renewals or replacements, and are, therefore, in place of parts represented in the original investment, and hence to be included in the inventory as such.

(2) Parts of plant which have been installed as extensions or betterments, and which have been paid for by money borrowed from the depreciation reserve. These parts should, therefore, be included in the inventory and appraisal because they are not a duplication of investment, but represent additional investment.

As has been shown, the balance to depreciation reserve should be credited each year with interest at the rate agreed upon. The money so borrowed has to be returned when required for final renewals, and must be repaid from capital. In the meantime, the company has been able to defer the day for permanent financing. These extensions can be considered as capital investments; the amounts borrowed from depreciation reserve, with interest thereon, standing as a liability against the proprietors. In this connection, the point may be again made that, whether there is a depreciation reserve or not, the liability for renewals rests against the proprietors.

As to whether there shall be a depreciation reserve or not, concerns the proprietors, and in no way concerns the public or the consumer. In any case, the cost of final renewals must be paid from income; and it can work no hardship to divide this cost as uniformly as possible over the years of service. This could be done by estimating the cost per 1,000 cubic feet without necessarily making any journal entries. The journal entries, and all that follows, are simply

steps in accounting which make for greater accuracy and permit at any time the regulating authority to check up the methods pursued. If the plant is not so maintained as to give efficient service, either by failure to make repairs and minor renewals from current income, or later to make final renewals, the liability rests upon the proprietors, and can be enforced by the regulating authority.

If the deductions were made from the appraisal of plant to cover neglected repairs or renewals, and then the deficiencies, under the orders of the commission, were made good, the investment would remain impaired, and so there would be confiscation. If the price were fixed on the basis of this valuation, so reduced by depreciation deduction, then the price so reduced would not be sufficient to give a fair return upon the entire necessary investment. If extensions to plant were made after this reduction in price, the price then could not afford a fair return upon this undepreciated additional investment. The final outcome would be, if this confiscatory procedure were continued, that the plants so affected would not be extended, and the public to be served would suffer. If it is claimed that the rate of charge would be increased to meet this restoration of the plant, the answer is that it is much easier to reduce than to increase a price, and especially so as to the service rendered by a public service corporation.

As a certain member of one of our most influential commissions said recently in this connection: "We are representatives of the people." It might be suggested that, as our public service corporations are largely owned by the small investors, either directly or through banking agencies, the commissions, if they are to protect all the people, should be encouraged to act impartially between the sellers and the buyers of service.

Our confidence as to the future is increased by the knowledge that some of our commissioners are strong enough

and fair enough to take this position; and the number is increasing. One notable case can be referred to, of a man who went into office avowedly opposed to public service corporations, believing them to be what the interested politicians accused them of being, but at the end of his five years of very active service, publicly declared that he had found greater fairness, candor, and honesty with the corporations' representatives than with the representatives of the people.

Question No. 4: In the making of plant appraisals for any purpose, should present actual depreciation be measured by reference to tables of expectation-of-life prepared for estimating accruing liability for final renewals, together with the ascertained present age of the plant?

Answer: If what I have so far said is conceded, it follows that the accrued liability referred to cannot be ascertained by reference to tables of averages computed from the study of plants dissimilar in many ways. Such an estimate of accrued liability, to support any claim to accuracy, must be based upon a careful and competent study, preferably extended through years, of the plant under examination.

If, then, we wish to know the condition of plant at any time, why refer to such tables? Why not examine the plant itself, having in mind its condition as to physical decay, obsolescence, and inadequacy? Certainly, if we desired to learn the cost of an elaborate structure, we would not consult the preliminary estimates of the architects when we could have access to the treasurer's final and complete records.

Were it not for the fact that many prominent engineers are following the practice of using so-called standard tables in estimating present depreciation, deducting in proportion to the age of the plant, I should not think it necessary to treat this question seriously. This method, reduced to its simplest terms, is something as follows: A plant is assumed

to have an average life of fifty years. The average age is found or assumed to be twenty-five years. Result, depreciation 50 per cent., investment impaired 50 per cent.

Perhaps it is unnecessary to say that the men who err most radically in this direction are book-men, who have had little or no practice to balance their faulty or incomplete theories. In the United States, the professors of economics and statisticians are much in evidence at present; and many of these men are striking examples of the "blind leading the blind." The recklessness of statement indulged in by some of these men, depending as they do upon the reading of books, often each other's books, is simply appalling. It is still more appalling when we reflect that not a few of these men are teaching their destructive doctrines to the young men attending some of our prominent colleges and universities.

To determine the amount of actual depreciation of a plant presents many difficulties, and calls for superior capacity founded upon scientific attainments and broad and exact experience. This determination may be required in connection with a change in ownership, that it may be known what expenditures, in addition to the purchase price, are required to bring the plant up to the required productive capacity and efficiency. Or, it may be required to check up the accuracy of estimates on the cost of maintenance, including final renewals. Or, it may be required by a public service commission to test the justice of a complaint as to faulty service. In any case, the facts are to be learned by expert examination of the plant itself, having in mind physical decay, obsolescence, and inadequacy. If life-tables are employed, they should be used with the utmost caution, and then only as a most general guide, and never by those who have not had adequate experience as constructors and operators. Perhaps the greatest danger in these tables is that they encourage those who are incompetent to think they are competent.

Question No. 5 (a question recently asked): Assume a plant that has cost \$100,000; its average life, 40 years. At the end of the first year's operation there has been charged to loss and gain \$2,500 (\$100,000÷40) as the year's proportion of depreciation, and a satisfactory dividend has been earned and paid to the shareholders. Then, as the shareholders have received a satisfactory return on their \$100,000 invested and have also had returned to them \$2,500 of their principal, what right have they to demand a return next year on more than \$97,500?

Answer: Like many of the questions asked by the cross-examiner, this question, either through design or failure to understand the principles involved, is based upon faulty premises, and involves an unwarranted assumption. Assuming that the proposition as to non-deduction for accrued depreciation is accepted, then if the average life were forty years, \$2,500 should not be charged to loss and gain to cover the year's depreciation; but there should be charged such a yearly payment only as through the operation of a sinking-fund would be required to redeem \$100,000 at the end of forty years—and this for the purpose of renewing or replacing the plant. The end sought is so to maintain the plant as to maintain the integrity of the investment. The maintenance of the plant includes repairs, minor renewals, and final renewals. In this particular case, the amount so required for a 4 per cent. sinking-fund would only be \$1,050.

Whether or not \$2,500 or \$1,050 has been charged to loss and gain against income, this is not a return of part of the investment, because, when correctly estimated and computed, it is part of the cost of maintenance, and hence a charge against cost, quite as much so as repairs and minor renewals. (I apologize for repeating such a self-evident proposition, but it seems to be necessary.) Again, if the amount charged is \$1,050, as it should be, this amount, and the succeeding payments, must be invested in one way or

another so that the earnings or interest on the annual payments may also be added to the fund to produce the required \$100,000. When we bear in mind that for a forty years amortization at 4 per cent. the forty annual payments only aggregate ($1.05 \times 40 =$) \$42 per \$100, and the interest accumulations have to produce the required remaining \$58, perhaps we can better appreciate that the annual renewal reserve payments cannot work as earners of dividends for the stockholders; but they have their separate work to do for the stockholders in earning interest to be applied to the protection of the investment.

It is to be remembered by those who are puzzled by question No. 5 that the \$100,000 plant must continue to be a \$100,000 producer of service year by year. If depreciated to \$90,000 at the end of the fourth year, only a \$90,000 service should be expected then from its operation; at the end of the thirty-ninth year, only a \$2,500 service should be required from its operation.

Over and over again the question is raised in one form or another: If the consumer has been charged for depreciation in the rates, why should he be charged again through failure to deduct for depreciation? The depreciation, or cost of final renewals, is part of the operating cost; and there would be just as much reason for reducing the investment because certain amounts have been charged into operating cost for coal, wages, salaries, etc., as there would be for reducing the investment in plant because the cost of maintenance has been included as part of that cost.

Finally, nothing that I have said as to the determination of actual "depreciation" is to be taken as an admission that in a rate-fixing case any deduction should be made from the appraised cost to reproduce plant new to cover so-called accrued depreciation, or, more correctly speaking, the accrued liability against the stockholders for final renewals or replacements. This is a liability resting against the pro-

prietors; and they must be given the normal opportunities to meet this liability without in the meantime suffering confiscation of investment by anticipation of the dates when the several payments to meet this liability may fall due. It is the part of wisdom for the owners of properties to reserve from income *all* that may be required to preserve intact their property investments; but this establishes no reason for deductions for depreciation in connection with rate-fixing.

If, however, the public service companies are to be required by the commissions and courts to face a demand for deduction for estimated accrued depreciation, then ordinary prudence suggests that there should be charged up for such depreciation each year the amount found by dividing the cost of plant by the estimated average-life; that is, "straight line depreciation."

Let us hope that the commissions and courts may be convinced of the justice of the proposition herein presented, that is, estimated depreciation charged on the sinking-fund basis, and then no deduction from appraised value for depreciation so accrued on effective plant.

THE ENGINEER AND THE WORLD'S WORK*

By J. H. Cuntz, '87

WHAT distinguishes the past century from all that have gone before? What has enabled the human race to make an advance greater than in all the preceding centuries, and to reach a stage of civilization from which there can be no great recession in the future? What has made the world as it is today?

The work of the engineer.

A few examples from the experience of our own country will help us to realize how the engineer has changed the course of history.

When Edmund Burke made his great speech on Conciliation with the American Colonies, one of his strongest arguments was based on the remoteness of America from England. He says: "Three thousand miles of ocean lie between you and them. No contrivance can prevent the effect of this distance in weakening government. Seas roll and months pass, between the order and the execution; and the want of a speedy explanation of a single point is enough to defeat a whole system. . . . This is the immutable condition, the eternal law of extensive and detached empire."

That condition has now been entirely changed by the engineer. The ocean still rolls between the shores of the old world and the new, but communication between them is now instantaneous, and men can travel from one to the other in four days. It is not too much to say that modern

*An address delivered before the Woman's Press Club of New York City, January 25, 1913.

means of communication might have prevented the Revolution.

The battle of New Orleans would never have been fought if an Atlantic cable had existed in 1814. The treaty of Ghent, which ended the War of 1812, was concluded on December 24, 1814, and more than two weeks later, on January 8, 1815, Jackson won his memorable victory, without which he might never have reached the White House in later years.

Without the telegraph and the railroad it would be difficult, if not impossible, to keep all sections of our extensive country bound together in a close political union, and it would certainly be impossible to attain and preserve that wonderful homogeneity which characterizes our hundred millions of people spread over our three millions of square miles. Even such slight differences of speech as yet exist will become equalized with the extension of the telephone.

The Institution of Civil Engineers, in many respects the premier engineering society of the world, has defined the profession of engineering as "being the art of directing the great sources of power in Nature for the use and convenience of man."

Such has been, and is, the aim of the engineer, and a brief review of his work will show us how well he has succeeded.

The engineering era began with the improvement of the steam engine by James Watt, which made it a commercial success and an active force in the world's work. The steam engine multiplied man's strength a thousandfold, and its application to navigation and to land travel enabled him to transport himself and his goods to the ends of the earth with swiftness and safety.

The telegraph was the forerunner of the electrical age, which has given us the telephone, the electric light, the wireless telegraph and the many applications of electric

power, while improvements in the gas engine have made possible the automobile and the aëroplane.

All over the world at the present day the work of the engineer is transforming the face of Nature or directing her sources of power to the use and convenience of the human race. Down at Panama one of the most tremendous works ever undertaken by man is now nearing completion, and the great oceans will soon be joined. All the continents except Africa are now crossed by railroads, and even on the dark continent the iron horse has penetrated to its center, and the Cape to Cairo road is half finished.

The arid regions of the earth are being made productive by means of irrigation projects, to which all the resources of modern science have lent their aid. Egypt and Mesopotamia are being rejuvenated, and in our own country the United States Reclamation Service is doing work of vast importance and value. In hundreds of places throughout the West, orchards and alfalfa fields have replaced the sage brush and the cactus within the past few years, and thousands and thousands of happy homes have been established under the irrigation ditch. Our streams are used not only to enrich our soil, but also to generate electric current which can be transmitted hundreds of miles and converted to a multitude of uses.

But we need not go far afield to see great engineering works. Right here in New York are centered some of the greatest in the world. The East River is spanned by the three longest suspension bridges and the heaviest cantilever bridge now in existence. Under the Hudson and the East Rivers are the most extensive subaqueous tunnels, and under our streets the most remarkable subway system on, or rather under, earth.

The piercing of the Swiss Alps by the St. Gotthard, the Simplon and other tunnels attracted world-wide attention, and rightly so, but how many people realize that far down

in the rock which underlies Manhattan Island and the Upper Bay a tunnel is now being driven which will be twice as long as the greatest one through the Alps? And this deep New York tunnel is only a part of the system which will gather the waters of the Catskills in an immense artificial lake, and convey them a hundred miles to the metropolitan district through an aqueduct which pierces mountains and, at Storm King, plunges 1,500 feet below the Hudson.

Many more works are being planned or are under construction. Others of great magnitude and daring have been projected, such as a bridge across the Hudson, and an extension of Manhattan Island southward to Governor's Island and even beyond. This last is not as fanciful a project as it sounds, for Governor's Island itself has recently been doubled in size by building a sea wall and then pumping sand inside.

The engineer is prepared to perform even greater works than have already been accomplished, and to be of ever increasing service to humanity, but he is too often hampered by political and financial obstructions. What could he not do if given a free hand in this metropolitan district?

New York has grown in a haphazard way, generally unaided, if not actually hampered, by the powers that be. The problems arising from her growth have been attacked only when they became too pressing to be longer evaded, and their solutions have too often been only makeshifts. Where other communities strain every nerve to attract commerce, she calmly contemplates the probability of the greatest steamships in the world going elsewhere because she has not had the energy and foresight to provide adequate docking facilities, with all her magnificent natural harbor. Officials and commissions wrangle for years over plans for rapid transit, while the people are herded like cattle in subway and on elevated.

The engineer is ready to solve these problems and is anxious to get to work. He is able to do far more than what is immediately required, for he is trained to look ahead and to have a large vision of the future. In order to effect a permanently satisfactory solution of New York's municipal problems there should be a re-distribution of her population and industries, and this is largely an engineering proposition. The metropolitan district, including the neighboring parts of New Jersey, should be viewed as a whole.

Factories should be moved from Manhattan Island and be reëstablished in the most advantageous situations. Employees should be moved to healthful locations convenient to their work and enabled to obtain comfortable homes. Rapid transit by bridge and tunnel, subway and elevated, should be furnished. Ample docking and terminal facilities should be provided. All these plans must be carried out in a broadminded and farsighted way. The engineer is ready. Give him a free hand and let him get to work!

What may be called the aesthetic side of engineering is receiving more and more attention. While in the past the charge that engineering works were ugly was sometimes justified, this reproach is being done away with. Engineering is not only compatible with beauty, but the best engineering is almost necessarily beautiful. The architect and the engineer are working hand in hand to build our bridges, our skyscrapers, our docks and our railroad terminals. An artist like Pennell grows enthusiastic over the picturesqueness of the Panama Canal, and our skyscrapers are winning the admiration even of foreign critics, for in some of their aspects they fulfil the dreams of the poets.

Last summer I was at Niagara Falls on a clear moonlight night. My friend, the engineer of the Niagara Falls Power Company, took me in his automobile across the International Bridge, whose graceful arch, the widest in the world, spans the rushing waters.

We drove to a power house on the Canadian side, a granite structure of severe but chaste architecture, standing near the rapids above the Horseshoe Falls. Inside, the dynamo room occupied the whole length of the building and contained a dozen electrical machines, each capable of generating over 12,000 horsepower. These dynamos, shaped like gigantic flat tops, were driven by water wheels far down in the pits below. They spun with a velocity at their rims of miles a minute, and gave forth a deep humming note. Beyond this there was no sound in the vast hall, and no human being was in sight except an occasional attendant making his rounds.

On one side in the gallery there was the switch-room, where, on white marble panels, were arranged instruments of glass and ebonite and shining brass. All this apparatus was so skillfully and wonderfully contrived that a little lever, moved by a single finger, could release and control the power of thousand of horses.

Outside, shining in the white moonlight, were the everflowing river and the thundering cataract. Inside, the swiftly spinning machines, sending invisible power far and wide, for lighting, for transportation, for manufacturing. Nothing detracted from the beauty and majesty of the scene, and the forces of Nature were here most effectively directed to the use and convenience of man.

We cannot tell all that the coming years hold in store for us, but I like to think of that quiet power house beside the moonlit river as a type of the engineering work of the future, where Nature will still retain her primal beauty, and where man shall have learned to utilize her secret powers to evolve a higher civilization than we have as yet any conception of.

A METHOD OF CHECKING THE ECONOMICAL HEIGHT OF AN OFFICE BUILDING*

By C. T. Coley, '01

I CHOSE the subject: "A Method of Checking the Economical Height of an Office Building," both because it is a problem that is encountered almost daily, and one for which I have not seen a satisfactory solution; and consequently thought that the development of a solution would be a little new and interesting to you.

We will consider the erection of one of the most modern and expensive office building skyscrapers, the construction of which must be of the very highest grade. The plot of ground should be in the very best location for a building of this kind. Let us assume a land value of $300 per square foot of lot area. The value of a plot of ground is determined by the best possible use to which it can be put, or improvement that can be made thereon to bring in the largest net financial return per annum, upon the money invested in the lot. The value of a plot of ground is, therefore, dependent upon its net annual earning capacity, which earnings are usually funded at 5 per cent, making the value of the land about twenty times the net return per annum earned by the land.

The annual interest charged on $300 valuation per square foot would be $15, money worth 5 per cent. The New York City taxes are about $1.83 per $100 valuation, which on each square foot of land under consideration, would be about $5.50 per year. This added to the interest cost of

*A paper read before the National Convention of Building Owners and Managers'

$15, makes a total cost of $20.50 per year for owning one square foot of land in the best financial business district on which to stand a building. If the entire area is not covered by the building, but say only 95 per cent of the total, the balance being used for light courts, we must divide the total cost per square foot per annum ($20.50) by 95 cents, giving $21.58, the amount that must be earned per annum on each square foot of land on which the building actually stands. Since only 65 per cent of the area is rentable area, to produce one square foot of rentable area, we will require one divided by .65, or 1.54 square feet of floor area, and consequently the annual land carrying charge would be increased from $21.58 to $33.23 per square foot of land over which to secure one square foot of rentable floor area per floor.

The question arises at once, what can be done to meet this great expense? One answer is, after looking around to see what is suitable for the neighborhood—build a skyscraper office building. What will one cost? How high will it have to be, so that the net profit on the building, will equal the expense on the land? What will the operating and other expenses be per annum? We will look into the problem.

Experience shows that office buildings of the very best type of granite, marble, bronze and steel construction cost from 80 cents to $1.00 per cubic foot of building volume to build. When the average distance between finished floors is twelve feet, it requires twelve cubic feet of building volume to produce one square foot of floor surface, of which past experience shows that in a well designed building, about 65 per cent of the total floor area is rentable area. Therefore, to obtain one square foot of rentable area per floor under consideration, it will be necessary to build twelve divided by .65, or about 18½ cubic feet of building volume.

Let us assume that we are to build a building about twenty-five stories high of the type costing 80 cents per cubic

foot. It would, therefore, be necessary to make an expenditure of 80 cents multiplied by $18\frac{1}{2}$, or $14.80 for eighteen and one-half cubic feet of building volume in order to secure one square foot of rentable area.

The costs of maintaining one square foot of rentable area per annum in a high-class building of this kind are about as follows:

Engine room labor, supplies and repairs, per sq. ft. rentable area	$0.18
Coal and ash removal, per sq. ft. rentable area	.15
Elevator labor, supplies and repair, per sq. ft. rentable area	.09
Janitor's labor and supplies, per sq. ft. rentable area	.15
Electrician's labor and supplies, per sq. ft. rentable area	.02
Supervision and collections, per sq. ft. rentable area	.09
Building repairs, per sq. ft. rentable area	.15
Insurance, per sq. ft. rentable area	.01–1
Water, per sq. ft. rentable area	.02–1
Sundries, per sq. ft. rentable area	.01
Sub-total	$0.88
Taxes on structure alone, per sq. ft. rentable area	.27
Total	$1.15

Assume an allowance of 10 per cent of gross rents for vacancies and loss of rent on an average rent rate of $3.50 per square foot—35 cents. Now, making the total $1.50. Interest at 5 per cent on an investment of $14.80 necessary to produce the required building volume to secure one square foot of rentable area, 74 cents; allow for depreciation and amortization in fifty years about 30 cents. (Money worth 4 per cent compounded semi-annually and one per cent depreciation.) Total cost per annum, $2.54 per square foot of rentable area. Subtracting this cost of $2.54 from the gross rent rate of $3.50 per square foot of rentable area, leaves a net profit per square foot of rentable area of 96 cents per floor.

In order to equalize or wipe out the annual expense of

$33.23 for the lot area on which to build one square foot of rentable area, we would needs get the profit of 96 cents per square foot rentable area per floor by repeating the operation or building floors upon floors as many times as 96 cents is contained into $33.23, or 34.6 times, making the building thirty-five stories high.

Hence it will be seen that to develop or improve a plot of land properly, with the value assumed which will pay 5 per cent on the investment in the land and building, and at the same time set aside a proper fund for depreciation and amortization, a thirty-five story building will be necessary. This would be the proper height for the building, provided that the plot area was sufficient to allow for the proper shafts up through the building to contain pipes, smoke stack, stairs and elevator shafts and still give a rentable area of the assumed 65 per cent of the gross area.

There is a subject which is almost analogous with this one, which really should be considered with it. We may have a skyscraper craze, and Doyle might say: "Well, If I can break even with a thirty-five-story building and pay myself 5 per cent on all of the land and the building, why not go up sixty stories and pay myself 5 per cent more, giving me 10 per cent. That is Doyle. But along comes little Mr. "Elevator" and says, "You cannot do it. We cannot serve you away up in the air."

The maximum depth of an office which we can rent is from twenty-five to twenty-seven feet. Some of you go thirty, some twenty-five, but you don't get anything for the last five feet if over twenty-five feet deep. There are only three things we have to sell—light, air, and quietude; resulting in peace of mind, and peace of mind means good service in the building. It means that at the top of a building, thirty-five stories high we can get the maximum rent, because the tenant can get good air and have daylight. You cannot satisfy them with gas light or electric light, it

is sunlight and good air, quietude, away from the noise of the street, peace of mind, good service.

Now, we will try limiting the boundaries inside of a given lot. The distance we will assume to be thirty feet all the way around the lot, which is the maximum depth of the office you can rent in that lot. Of course, you must allow space for stairs, elevators and so forth. You can see that we could go up high enough with the building so that the entire inner space is filled with stairs, smoke stacks and elevator shafts. For a building fifty stories we would need maybe seventy-five elevators; for a building forty stories high you would need maybe sixty elevators, so in place of going so high, architects are wisely putting in courts. What happens? You get rentable area lower down. That means we have more rentable area per floor. Keep the buildings low. Don't go so high. Think of the height of the building and the elevator service it takes to go from the ground floor away up to these heights.

I will tell you something of how I arrived at some calculations that determined the proper number of elevators to put in the new Equitable Building. That building will be thirty-six stories high and contain about twelve hundred thousand square feet of good light rentable area. I have tried to give elevator service throughout that building, which I consider to be the most important of all services in office buildings of the best type, as good as any of our friends and competitors surrounding us. I have tried to give in the schedule which I have laid out exactly the same elevator service to a man located on the thirty-fifth floor as to a man located on the tenth floor. Two men, friends, walk down Broadway together. They enter the building. One goes to the tenth floor, the other goes to the thirty-fifth. They get to their respective banks of elevator, and both reach their offices at exactly the same time. It does not make any

difference, therefore, where you are in the building, you get the same elevator service.

Now, then, what does that mean? If there are any advantages because of light, air, quietude, peace of mind, you can charge for it.

This building contains, as I said, a little over a million square feet of rentable area, we will assume in round figures about thirty thousand square feet of rentable area per floor. In New York by careful count statistics show that the density of population in buildings surrounding the Equitable site is about one hundred and twenty square feet of rentable area to the person in a building. The population, therefore, in this building is the rentable floor area throughout the building divided by the factor one hundred and twenty. That will give you the probable density or number of people in the building when the building is fully rented. In this building it shows that when the building is fully rented there will be about eighty-three hundred people doing business in that building exclusive of their friends and customers. That is a big crowd to handle. Statistics further show that in New York from 20 to 30 per cent of the total population of the buildings come downtown, come across the ferries, and the bridges and enter the building in fifteen minutes, between nine-five in the morning and nine-twenty-five. It is a service that I do not believe is demanded anywhere else in this country. In Chicago they are workers. They go to work at eight, the bosses come in at ten, the bosses go home at four, the workers go home anywhere up to six. They have two hours to fill the building and two hours to empty. New York practically fills its buildings in one hour, and they put 30 per cent of the population into the building in fifteen minutes.

In order to meet that great demand and still give the people "service," the principal thing they pay rent for, is worked out here. This was done by the trial and error

method. I first made up my mind I wanted forty-eight elevators, high speed electric overhead. The next thing was how to divide them up, how many floors to allow each group of elevators to serve, what speeds to make them, what car size to make them so as to control the people automatically.

After a great deal of calculation, we finally decided to run one bank of eight elevators and serve all of the floors from the first to the tenth inclusive. The shaft is, therefore, built for eight elevators, and doors put in to serve twelve floors, extending the shaft up two more floors.

As we go up into the building the number of floors served per bank of elevators decreases. One is nine, another is eight. This still decreases until it is six and five.

You say, why do you do that? Because the tenants in New York demand elevator service of at least thirty seconds. A car must pass a floor in any direction every thirty seconds. We have varied the size of the cars. The size of one car is designed so that twenty people can go in with the operator. The reason for this size of car is obvious. We serve ten floors, so there are more people to handle per car. The size of another car is still a little smaller, holding seventeen people, another one fourteen, one thirteen, and the high rise bank twelve. The reason that is done is to prevent kicks. The starter can not stop passengers from entering a half-full car without making trouble. Vary the size of the cars and you control your service automatically and can start the cars on time.

There is another feature of this elevator service which is rather novel. It is novel because there are not many of us who have seen more than two or three banks of elevators in one building. It is novel again because there are no transfer floors. One car comes to the tenth, and the first stop of the next bank of cars is the eleventh. If a man is on the wrong car, he can get off and use No. 6 bank of cars.

We take care of that man. What he can do is this,—and in a building containing eight thousand people there will be lots of business done, one tenant with another. We have provided an additional bank of eight elevators called the intercommunicating bank which serves all of the floors of the building, and stops at all of the floors of the building from the basement to the roof.

The speed of the cars, of course, you naturally would expect to vary in the several banks of elevators and they do. The speed of one bank of cars under full speed would be five hundred feet, one five-fifty, one six hundred, six hundred and another six hundred, so that in the straight run they can make time. Of course, you appreciate that during the local stopping period the speed will not be six hundred, it will not average that because of the stops, but in the straight way, there would be almost four hundred feet of straight run without a stop, the speed would be six hundred and fifty or six hundred feet.

There is a novel feature about design which was first proposed by me and adopted by the owners of the Bankers Trust Company Building in New York, that is, to put no elevator doors on any of the floors not served by that respective bank of elevators. It was a novel proposition. "What happens if you get stuck in the shaft?" We put intercommunicating doors in the side of each car, so that you could bring it up alongside of another car and transfer across through the cars and release the passengers. I must admit that during the last year and a half that I have operated the Bankers Trust Building I wonder whether my suggestion was going to prove a success or a failure. If success, it meant that in this building we had two hundred and eighty square feet additional of rentable area in front of the express bank of elevators in the local floors, which at three or four dollars a square foot meant almost a thousand dollars a year additional rental per floor because of that little idea.

After the local elevators stop, of course, we built the floors up above the locals for use as it is common practice.

But in connection with that let me warn you about one thing if you enter into the designing of a building. The overhead of a bank of elevators such as that which stops down within the building below the roof and is filled with machines, which machines absorb energy, and energy is heat, so we will get right back to old mother heat. All of that heat, therefore, is dissipated in that machine room and you cannot expect men to live in it unless you ventilate it. I am citing that because it is a mistake which is made often, but it is possible to ventilate the machine room of a bank of elevators when it is within the building and not containing windows in it or skylights.

Two of these elevators will be capable of lifting about seven thousand pounds. The largest safes we bring into offices in New York weigh about six thousand pounds. Two of the elevators that stop at every floor will run down to the basement of the engine room so that the engineer if necessary, or his assistant can go quickly to any part of the building without using the staircases. We have in addition to the high rise a plunger type of elevator that goes down to the basement below the engine room.

We have a lot of interesting problems in a building like the Equitable. We have a power plant of four thousand horsepower, fifty tons of coal to get in every day, twelve or fifteen tons of ashes to get out every day; it gets down to power plant proportions.

I first made up my mind as to the number of groups of elevators we were going to have, and my final conclusion was that bank number one, would serve from the second to the eleventh floor, inclusive, making ten floors actually served; the second group from the twelfth to the eighteenth inclusive, seven floors served; the next from the nineteenth to the twenty-fourth, six served; twenty-fifth to the thirtieth,

six served; thirty-first to thirty-fifth, five served, with the auxiliary group landing you on the roof. There is a convenience which I find to be very valuable in operating a building. Give service to the roof so that a car opens onto the roof, so that we have an auxiliary elevator onto the roof.

If a passenger gets on number one bank of elevators by mistake and wants to go, we will say, to the thirteenth floor, he can use this auxiliary bank of elevators and he can get off at any floor he wants, as soon as he discovers his mistake; he can call the next floor, get off, and walk over a short distance to the auxiliary bank of elevators and go to any floor that he desires either up or down. That is for intercommunication and for mistakes.

A car six by seven we allow four square feet for the operator and two square feet for each passenger. The operator has got to move around, open and close his door, operate his control. We allow for each passenger that may occupy that car two square feet, a comfortable load.

Here are two important points. Our schedule shows the round trip time in seconds. Any elevator can land on the ground floors, open the doors, take in its people, start up, make a stop at every floor in the section served, start down, stop somewhere in the length of the run down, take on a passenger, shut the car door, go for the bottom, let that one passenger out and the cycle is complete. That cycle taken in this calculation is 181 seconds, practically the average. Every car in the building can do it exactly in the same time.

Another point is to give them all the same service. As I told you before, that is very important. Do not let a man have an excuse for not paying for the nice light up on the top of the building because of poor elevator service. Make the time in the area served by the car until you can get the cars exactly the same throughout the building, and equal to our friends and neighbors, twenty-three seconds between cars in the rush, in the maximum load conditions,

and at ten or eleven o'clock we can get it down to a basis where we can make it in fifteen seconds.

A good thing for us office building managers is to decide if we can ever get our association in the various cities, to decide some of these economic principles. You can see there is no limit to the elevator service an unreasonable tenant can demand. He can demand elevator service every two seconds on a floor. Before one car gets away, the other cars must be there, and where shall we stop? There is one building in New York in which I have made tests that gives a car on a floor every fifteen seconds. They are going too far, taking all of the profits out of the building, so that we ought to decide among ourselves as managers to advise the owners as managers, not in combination, but as a business agreement that we shall not give in any building better than thirty-second service, which is as good as any reasonable man should have. A few years ago when we had the old type of hydraulic or steam-driven elevator, if we got a car every minute and a half you were mighty lucky to ride down and not walk, and we were entirely satisfied. It is all a matter of comparison.

The matter of the location of the ladies' master toilets is rather important for the elevator service. If it was not for the fact that we consider it very advisable to give flexibility to the shaft so as to take care of possible future zones of population in the building, I would recommend that the ladies' lavatory be put on the last stop on the down in each group of elevators, for this reason. The matter of handling women in office buildings demands considerable elevator service, and the major cost of running any electric elevator system is the cost of stopping and starting. If you put the women's room on the lowest floor, you are running slow, and the operator knows under most all average conditions he would make the last stop. Now on the up he is going at full speed over the blank shaft. He has to retard, he cannot

go into the top section of the building at full speed. He retards, and if he is retarding, it is easy to make the first stop. He expects to stop. If the operator on the elevator expects something, you have no trouble, but it is the unexpected which causes over-runs, reverses to hit the floor. It means we get two or three stops to make the landing, when the operator ought to take it in one.

I might say that the enthusiasm for high buildings took possession of some of us when we found that forty-eight elevators would serve thirty-six floors. The question was asked, why not go to forty floors, or forty-four floors. We can go there, but we cannot give the service, and what is the use of building any kind of a building that you cannot give service? The architect and the man who supplies the brick and mortar get the profits. The owner has a big bunch of mortar he cannot rent. He is carrying it as a dead load with no earning capacity, so make every square foot of area that you put in a building rentable. Don't build it unless you know that it can rent, unless it has got all the facilities which induce tenants to take it.

I think this will illustrate my next point. In the Bankers Trust Company Building at 14 Wall Street, New York, taking an express car, after you leave the ground floor, the first door opening that you pass in the shaft is at the sixteenth floor. That does two or three things. Those cars run pretty fast, but when you are riding in a Pullman car with good springs under the car, there is only one way you can tell how fast you are going and that is to see the telegraph poles go by. We do not provide any door openings or telegraph poles for the people to see go by. We have got a perfectly blank shaft, and the first thing you know you see a number flash by which is the signal that you are approaching the sixteenth floor, so you can shoot up very fast without the slightest feeling of speed, because you see nothing and feel nothing.

Don't over-illuminate your cabs or your public halls artificially. If a tenant comes into a building the hall ought to be lighted brighter than the elevator cab. The pupil of the eye will gradually open up as he comes into the hall. It will seem dark at first, but by the time he reaches the elevator it seems quite normal. He gets into the cab, which is lighted a little darker than the hall. His pupil still opens up. He gets off at his floor, walks into his office and says, "What a beautifully lighted office." If you give him too much illumination in going there, when he gets into his office it appears to be dark. First impressions are what count.

There are openings at the bottom of this shaft which are not used for passengers. Freight, building employees, anything in the operation of the building, is brought down and is kept out of the main hall. All the dirty, greasy things are kept out of the hall. It is all done from a platform, which is called a working platform. If a great length, six hundred or a thousand feet of cable is dragged along the white marble halls, what janitor can ever get it clean?

Another thing, do not let any architect talk you into serving two ground floors. You cannot get good elevator service if street A is at one level, street B at another level. There has been a great deal of enthusiasm over trying to serve the subway crowd and give them elevator service from the subway level. That kills a building. They would walk up outside from the subway and they are mighty glad to do it uptown. Let them do it downtown. You could put an escalator in from the subway entrance to the first floor, which I believe the Western Union Telegraph Company is doing in its new building to serve that subway crowd.

THE RELATION OF THE ENGINEER TO PUBLIC IMPROVEMENTS *

BY JOHN A. BENSEL, '84

AMONG the incidents which mark the various phases in the development of a man, probably none is more individually important than that which marks the termination of his academic training, when he leaves the institution where he received his education and takes his first step into the field where he must practically apply what he has learned in the operations that surround the general field of activity where he follows the work of his profession. You have arrived at this period, and, like all, under similar circumstances, must look backward with some regret and a certain amount of homesickness at leaving the institution where you have learned what can be taught by books and lectures and view the strenuous fields of activity into which you are about to go and where you will be left to yourself to practise and follow your profession along the lines where your ambition and fate will lead.

At this period throughout the entire country schools and colleges are sending their representatives into the world's activities, and the older generation can well afford to extend a welcome to you and to the graduates of other technical schools as you go into the field of engineering activity. In all of the professions the movements are greater and the developments more rapid than have ever before occurred in the world's history, and this to my mind is particularly true of the engineering profession, and I know of nothing

*An address delivered to the graduating class of the Clarkson School of Technology.

which brings this activity so prominently before one as to realize that the older generation of engineers who laid out the railroads and canals of this country in the first instance have but recently passed from the scene of their activities. And while I know this to be true, it sometimes seems almost incredible that I personally knew for many years, while carrying on my work, a man who designed the first engines for use in the naval vessels of the United States. It may be true, as is often said, that human nature in its elements does not change or vary, but certainly the human machine in its various forms of activity has changed most amazingly along the lines of applying the forces of nature to the benefit and improvement of man. This has been due in a great part to the multiplication and stimulation of discovery along the lines of engineering activity as well as to the discoveries that bring new elements into the field of operation and broaden, in this way, the lines by the changes that are occurring thereby in our social system.

That so many men of scientific training should each year be put into the world's activities is encouraging to everyone who believes in the benefits to mankind that will result from the fact that science is more and more getting the requisite knowledge to control the forces of nature for man's supposed benefit; and to my mind, both socially and politically, the hope of the future comes from the fact of this increase each year in the percentage of the technically educated who might be said to be particularly needed at the present time, when so many notions for the relief of humanity from its present ills are being put forward with nothing behind them except the feeling of sympathy which has engendered them, and the further feeling that, things not being as they should be, any change is for the better. It would seem, after all, that the real and permanent benefits to mankind are going to be derived, not from the following of untried schemes of change but rather by following schemes

derived from those who have been trained, and are thereby so mentally constituted as to be able to contemplate the facts in each case and to evolve from these facts the proper and successful application along which improvements should be rightly expected. Undoubtedly many of these things which we have regarded as permanent will have to be shifted and changed in our social system to make it fit, in some better manner, the demands of the people in this mechanical era in which we live, but it is important that this change should be made with a basis of calculation, and not, as might seem almost to be the case in regard to many of the notions which prevail, that these changes arise from what might be described in our closely settled communities as a sort of hypnotic suggestion.

In the field of engineering in which most of you are now about to begin your work, nothing is more marked to the older man in the profession than the large lines along which improvements, both public and corporate, are now necessarily undertaken. Railroads, in particular, are finding the demands made upon them, both for the accommodation of the people and of freight, so great at times as to make it almost impossible for them to fulfil the demands; and the aggregation of people in our cities has brought many new problems into the field of engineering which, after all, concern the very life of the cities, which exist as they do within twelve or eighteen hours of actual starvation in case their lines of communication happen to be cut or prevented from operation.

In the canal building in which this state has been preeminent among the states of the Union the change which has occurred from the time when the first canal was built through the various changes which have led up to the present design, and the requirements at this time, contrasted with those of the past, can be best grasped when one contemplates the fact that on the new Barge Canal of the state

of New York, when completed, one of the types of canal boats that it will be possible to operate will be capable of carrying as much tonnage as an ordinary freight train now carries; or, that the new boats, that it might be possible to use, can have a capacity about equal to eight of the boats which one carries in his mind when thinking of the boats which traverse the present canal system of the state.

Our concern, chiefly, is, that these activities which change the face of nature, operate beneficially to the lines of commerce and movements of population. What the great change now under way will mean to the people at large no one, I think, can safely prophesy. The Panama Canal, for instance, when completed, will alter the whole line of commercial trade from the lines along which it now operates through new and somewhat virgin fields. The new canal for the state of New York, will have, I think, as large an influence directly affecting the people of the state as the Erie Canal had when it was first completed; and although it is impossible to state with accuracy to what extent the canal building of the state has affected the growth of its population, and particularly the growth of its big cities, its influence must have been extensive when one looks back and notes that before the building of the Erie Canal the city of New York was exceeded in population by the cities of Boston and Philadelphia, and both of these cities seem to have had as fair a chance for commercial growth, with the advantage in their favor to become the greater cities on our eastern seaboard.

One interesting feature of the big improvements which are now under way is the fact that they are now undertaken almost entirely because of the demands of the people at large in their desires to secure, at public expense and for public use, lines of intercommunication throughout the state and the country which will belong to them as a public utility and be free from any possibility of corporate or

private control. In other words, the present generation is resuming control, to a great extent, over the natural inheritances of the people, who have grasped the sense of their ownership in those things which, to my mind, are inherently part of the public domain.

It is not remarkable that some effort has been wasted and that some funds should have been wasted during the processes of the evolution which has been going on along these lines; as, for instance, in the improvement of the waterways throughout the country, where it has been calculated that over six hundred millions have been expended in the developments of the waterways without commensurate return in the use of them by the people in the development of commerce. The reason for this lack of use, in my mind, in the past has been from the failure to grasp the real essential feature of public improvement, and that is, that at the scenes of activity public control and public ownership must be given so that access to the lines of commercial travel shall be had by all of the people without any possibility of interruption because of the reasons which develop along the lines of corporate ownership and control.

In following, broadly, these lines of the development of the people, no one should be better fitted to grasp the problems that occur than those graduate engineers who should be capable of reasoning from cause to effect and of making a proper calculation and setting down the proper elements in an equation, without which no correct result can be obtained. The element of human nature should be a part of every engineer's calculation, particularly where work is done within the confines of a thickly settled community. This element has too often been neglected by the engineer, who has assumed a position of dealing alone with facts and figures, leaving the uncertain element for the management of those more capable of understanding the reasons which govern men in the aggregate. To operate, however,

for the benefit of the people as a whole he must use his knowledge of affairs and men in the broader sense, and he will thus be able by his efforts to create something which is worth while in the development of the people as a whole, and will have as his reward the attainment of the peace and prosperity of his country and the realization that his work has led to the general good of his fellow men. His work must be performed as one of service, and the satisfaction which he gets can only come from the sense of having performed such service, which brings to mind the words of Kipling in describing a portion of the work of the engineer, which can form a fitting conclusion to what I say, and express best to my mind the manner in which the engineer's work must be performed:

> "Not as a ladder, from earth to Heaven,
> Not as an altar to any creed;
> But simple service, simply given
> To his own kind, in their common need."

THE GOOD ENGINEERING TEACHER, HIS PERSONALITY AND TRAINING*

By Prof. Wm. T. Magruder, '81

AT THE meeting of Section E on Engineering Education of the World's Engineering Congress which was held in Chicago in 1893 in connection with the World's Columbian Exposition, there were assembled "seventy or more" engineering educators from the United States and eight or more foreign countries. This society owes its existence to the congress and to the thought and labors of Professor Ira O. Baker, chairman of the Division Committee and Professor C. Frank Allen, its secretary *pro tem.* Of the seventy charter members, twenty-nine have either gone to their reward or have withdrawn from the society. Only forty-one of the seventy are now members of the society. Eleven of the living past-presidents are charter members, three became members in 1894, and one each in 1895, 1897 and 1902. That was twenty years ago. Some of us are no longer boys, even if we do feel as young and as full of enthusiasm as we did then. If time and your patience permitted it, and I were able, it would delight me to recall in great detail the lives and examples of some of the giants in engineering education whose successors we are—of the cultured Thurston, of that dynamic giant, DeVolson Wood, of that inventive genius, Robinson, of the courtly Chanute, of the erudite Johnson, and of the versatile Storm Bull. I offer you my congratulations on being allowed to follow where they have led the way.

*Address of the President of the Society for the Promotion of Engineering Education.

But after twenty years of this society's existence for the promotion of engineering education, at this its twenty-first meeting, when our growth betokens that we have come to our legal majority, at least in years, I desire to lead your minds into the consideration of what is a good engineering teacher and to give you an appreciation of his personality, and what he is as I have seen him in three score and more of engineering colleges and technical schools.

What then is a good teacher? And my first answer is that he is one who knows enough of his subject to have something to impart. I sometimes think the reason men from the highest ranks of consulting engineers so frequently make poor teachers, from the point of view of the students, is that they know too much, and cannot appreciate the fact that the students are down in the basement of the structure whose façade they are embellishing with artistic points of elegance and efficiency, and that the students are crawling on hands and knees along the path they are traveling with seven-league boots. In order that the teacher shall have something to impart, he should have had a proper education and some training, experience, travel and observation, as these are among the necessary qualifications for a good teacher. The man who has never earned his daily bread in the close commercial competition of the factory, works or mine, needs to learn one of the essential requirements of the successful engineering teacher, namely, to have rubbed elbows with workingmen of the artisan type and to have measured himself by their standards of knowledge and skill. One who has received only the education that he is trying to impart, possibly at his alma mater, probably in the same room in which he received it, who has never cut himself loose from his college's apron strings, and who has not taught or worked elsewhere, is not likely to make a good teacher until he has been trained in the school of experience elsewhere. If graduate students should migrate for their best

good, surely college teachers should do the same. In a previous paper before this society I have already referred to one institution, almost one hundred per cent of whose teachers in one department are the educational offspring of the great mind which presided over the department for thirty years. Experience of any kind always serves a teacher well, and the more he has had of that which pertains to the subject that he is teaching, the better it will be for him and his students. Travel and inspection trips, to learn by observation how others are doing the same thing that he is expected to do, are extremely broadening and take him out of his natural groove. It is needless to say that continued reading and increase in one's knowledge of his profession is absolutely essential for the advancement of the good teacher.

A good teacher is one who can talk on his feet audibly enough to be heard without effort and intelligently enough to be understood without subsequent correction. For, if the listener can not hear what is being said for his instruction, both parties are wasting time which is more or less valuable. If the recipient of the instruction continuously fails to get an intelligent understanding of what has been said, he has no right to be in attendance; and, similarly, if the teacher continuously fails to give an intelligent understanding of what he is trying to say, he should be removed and not allowed to waste the valuable time of the students. A man who can not impart his knowledge can not be a good teacher. Hence, health, adequate previous rest and endurance are essential to the good teacher. Few of us, I think, appreciate the difference in the instruction given and taken in September and in May, on Monday and on Friday, after a holiday spent in restful occupation and amusements and after an entertainment lasting until far past midnight. Some of us occasionally fail to consider and measure accurately the cash value of an hour of a class's time. We should be greatly disturbed if in our factory the power were need-

lessly shut off during the working hours of the day, or the lights went out at night, or the subsistence department failed to provide suitable food and lodging for our workmen, and we would at once discover the causes for this industrial inefficiency; but if the class is made to wait while a visitor or an assistant detains us, we may have little remorse, or indeed thought, concerning our academic inefficiency. To attend an engineering college it costs a student at least one dollar per week per credit hour of college work, or from sixteen to twenty dollars per week. If, therefore, the teacher in a college of engineering is absent without a substitute from a one-hour class-room engagement, it may be causing each of the ten to two hundred students to spend a dollar in needlessly trying to fulfil his part of the contract with the institution. The same is true of inexcusable latenesses.

A good teacher is one who has an unimpeached and deserved reputation for mental honesty, right living, patience under harassment and sound character. The engineering teacher who describes tricks of the trade, petty dishonesties, evasions of both the spirit and the letter of the law, without showing at least his disapproval of them, who shuts his eyes to dishonesties in class-room and college life, is neither a good teacher nor yet a good citizen. The teacher who is a leader in trickery, deceit and bluff during the term and who permits students to sit in an examination room so close together as to be under constant temptation to undesired dishonesty is *particeps criminis* to any dereliction of the student then, and possibly later. When cheating in examinations is made a *sine qua non* for honor and high grades, if not for graduation, and when the most skillful compiler of invisible ponies and the most successful cheater becomes the honor man of the class, as I have heard reported in recent trips among the colleges, it would seem that an old-fashioned course in moral philosophy and ethics should be in order for both the teachers and the students. We all fail,

I fear, frequently enough, but we should not be forced, or allowed, to fail inordinately. Occasionally we hear condonation expressed at the human frailties of the teacher, because he is considered as a genius in his specialty, and on account of his lovable qualities. Far be it from me to cast stones at my brother man, but I have never been able to discover a reason why a drunkard, or a libertine, should be tolerated in the teaching profession and frowned out of society in other professions and not allowed to work where the physical well-being of others was involved. Surely the mental and the spiritual well-being of our young men are paramount to their physical existence.

The one moral trait which seems to be most frequently demanded above all others from the teacher is that of patience. Some of us do not enjoy walking with persons who walk slowly or with very short steps, and who take a long time to get over very little ground. Similarly, we have to go equally slowly in expounding a new problem to a class, or in drawing out of even the average student the principle underlying the problem in hand, and in causing him to think about the subject consecutively and logically. We have all asked ourselves at the end of the hour, "How many in that class really took in the full significance of what I was talking about?" If this is true with the average class, how much more is it so with those members who are lazy or are naturally slow in their mental operations?

From the above it follows as a matter of course that the good teacher should deserve the respect of his students and his colleagues as a man, as a teacher and as an engineer. I think it frequently happens that the students know our failings and our strong points better than we do ourselves, or than they are known by our superiors. Student criticism may sometimes be unjust for want of full and complete information, but it must be remembered that the young human

mind is likely to be as keen in its perceptions as is the older mind of the man who occupies the other end of the room.

Another requisite in the good teacher is unbounded enthusiasm for and intense loyalty to the work of the teacher and of the engineer. We can tolerate the hireling in the commercial office and the drafting room, and the time-server may have to be put up with out on the works and in the mine, but the teacher, as a leader of young men and as a man who should be looked up to with some degree of that kind of respect which may grow into veneration, should be so bubbling over with enthusiasm that it will be contagious.

That prince of cultured scientists, Dr. S. Weir Mitchell, in giving at the semi-centennial celebration of the foundation of the National Academy of Sciences some of his recollections of the eminent men of science whom he had known, told the story of Professor Joseph Leidy's being asked "if he never got tired of life." "Tired!" he said, "Not so long as there is an undescribed intestinal worm, or the middle of a fossil bone or a rhizopod new to me." So, the enthusiastic teacher is never tired, so long as there is an intelligent boy to be trained or a mind to be developed. The engineer sets in motion the wheels of thousands of machines; the successful educator sets in motion the wheels of a thousand minds. Such a man can always get the work out of his students, even if they have to curtail the time properly due to some other instructor who is less inspiring. The enthusiastic teacher never counts the cost to himself of his labor for those whom he loves to call "his boys."

I am of the opinion that our engineering colleges are less handicapped than are the academic colleges by the services of men who are teaching for a year or two either while studying for the bar or for holy orders, or to enable them to repay the debts contracted for their college education by the means which will permit the least effort during the shortest time. As a rule, the call to work in the bustle of the manufacturing

and constructive world is preëminent in the mind of the engineering graduate. He is ready for the fray, and today he wants to get into it as never before, and no waiting until cooler weather or until after a summer vacation for him. "I am going to work next Monday," is his battle cry on commencement day. The courage of youth is beautiful to behold, and his zeal is a lesson to his teachers and to those who are following him.

Akin to enthusiasm for his work in the good teacher is his inspirational value to his students and his colleagues in the faculty. The former is the child of youth; the latter is the product of age and genius. When the teacher begins to lose his enthusiasm, he should begin to think that possibly he may be getting old, or else lazy. Not infrequently, however, the teacher who is devoid of enthusiasm may be of great inspirational value. He is the seer. He may be even halting in his speech, but by his ideas, his skill, or his manner of presenting the subject he may impress the student with the greatness of the profession that he is studying and lead him on to larger visions. Fortunately, the world needs both draft horses and speed horses, otherwise some of them would have to be put out of the way. Similarly, it is a great comfort to some of us to think that possibly we are doing the work of the world for which we are created, even if we are not breathing out great ideas at every breath. All hail to the man, however, who has ideas and can cause others to adopt them, to lift the world up and into larger visions, and so to do bigger things for the benefit of mankind. Great men are not necessarily either enthusiastic or yet inspirational, and some of the poorest teachers under whom I have sat were great men in other lines of human endeavor. But I am sure we can all recall some one of our own teachers who was both a great man and a good teacher at the same time. But, may I not ask, was he not a good teacher because he was enthusiastic and inspirational, and had no

thought of apologizing for being a teacher? The man who can never be a good teacher is he who is ashamed of his job, for to him it is most likely to be only the line of least effort to the pay-check.

The good teacher is he who has felt the thrill of having been called to the upbuilding of character in others, who day by day sees the unfolding of the innermost life of his fellow citizen, who has a life of service to live and enjoy, and who deals with human minds in the laboratory of life; for, after all, is not education only scientific research applied to character? Just as we go to the physician for improvement of the body, and to the priest for the betterment of the human soul, so we should go to the good teacher for the training in character which the young all need in different degrees. One of the inspiring sights of the college year and the one which always gives me a genuine thrill of happiness is on commencement day to look over the sea of upturned faces of men and women who have just been graduated and feel that we have been in some small degree a party to their training and responsible for their future success in the battle of life and in the part that they will hereafter play, for weal or for woe, as our fellow citizens in this republic. In their promise of success is our joy and reward for a year of hard work. But for the joy of service, some of us would not be willing parties to what the governor of Ohio recently described as "the scandal of low salaries paid to college professors." I sometimes think that school boards and trustees occasionally take advantage of the idealism of the teacher to get his services below the proper market rate; and this is especially true of engineering teachers who in most cases can, and sometimes do, earn more money from their clients during a part of the year than they receive from their professorship during the major portion of the year. All the pay of the good teacher does not come inside the pay envelope. Much of it comes in that inward consciousness of

work well done in the training for citizenship, for that efficiency which will prevent poverty, for success in whatever walk of life may be followed, and finally for the larger life here and hereafter. Some one has defined the professional class as the one that has no leisure, as instanced by the minister, the physician and the lawyer. Judged by that standard, we, as teachers, belong to the professional class.

Probably some of you have been wondering why I have not as yet said anything about the good engineering teacher being above all other things a good engineer. That goes almost without saying in this presence, provided you mean the *best* teacher. The engineering teacher who has never practised anything that he has taught, who has never seen built anything that he has designed, who has never prepared for an elaborate test of some plant or machine and found that he had foreseen all the various requirements in the way of labor, apparatus and equipment, even to the board and lodging of himself and his assistants, cannot expect to be considered as yet a really good engineering teacher. However, it must be remembered that as this is an educational society, and not an engineering or a technical society, as Dean Charles H. Benjamin has so aptly put it, so it must be remembered that the colleges need men who to be teachers must be first able to impart their knowledge, draw out from their students all that is in them, and cultivate in them the habits of correct thinking, clear vision, active imagination, sound reasoning powers, and good judgment; and because they possess these things themselves and can train others in them, they are therefore fit to be counted among the good teachers. It is for these reasons that good engineering teachers are said to be more difficult to find than are good teachers of other subjects.

A good engineering teacher must know what engineering really is. He must have clearly defined ideas on what are the distinguishing features of engineering, technical, manual

training, trade school and industrial educations. He must have no half-hearted ideas as to where the engineering trades stop and where the profession begins. He must not be afraid to get out into the deep water of the profession of engineering. He must not believe that the proper engineering education is strictly utilitarian and vocational, and not one bit cultural. He must look between the folds of the ancient armor of his colleague in the college of arts of his institution, and discover that the scientific spirit has largely superseded the literary spirit even in such subjects as Latin, Greek and the modern languages; that in fact in the work of some language teachers there is more of science than of language; that the so-called literary colleges are training men for vocations just as truly as are our colleges of engineering, law and medicine; that while the old-time classical colleges used to train men to be gentlemen, their successors in the educational world train men for journalism, insurance, politics, trade and business, as well as for education, the law and the ministry as heretofore. We engineers think that they are to be congratulated, in that they have enlarged their system of education and no longer make it so general as to fit the student for nothing in particular and non-technical as to be useless except as a preparation for one of the professions.

"To know the best that has been thought and said in the world" is what Matthew Arnold calls culture. To the engineer, this is not the fullness of culture, but the rather to know the best that other men have thought, and said, and done. Even this is only half of the full duty of a cultured engineer. He should not only know the best that others have thought, and said, and done, but he should, as far as he may be mentally able, have contributed to the thought, and writings, and doings of the world. The engineering, above all other professions, demands that its members shall not be solely scholars, nor yet students of unsolved problems,

but they shall have solved some of the problems which have pressed upon civilization for solution. Engineering teachers should be not scholars solely, nor yet students only, but pioneers and creators in the work of civilization. The first live in the spiritual palace called a library, where time, memory and the receptive faculties are alone required. The student lives in the laboratory where the powers of observation are developed, logic reigns and laws are discovered. The successful engineer lives on the frontier of civilization, on the firing line of human endeavor, where those material problems have to be solved that have been set for the ages, and where the art of creation is wedded to the science of industry. The scholar deals with the past. The student lives in the present. The engineer looks into the future and solves its problems.

To be a good engineering teacher, one must be something of a scholar, student and creator and, highest of all, an educator capable of leading others to be the same. Such men are necessarily scarce, and while their financial rewards may be small, the satisfaction that they very properly get from their work transcends all their many self denials and enables them to hold their heads up with the world's best people.

This society was formed for the promotion of the kind of education which has been described. This is its twenty-first annual meeting. It may be now said to be of age. In closing this address I desire to leave with the next program committee and the incoming officers just two suggestions with the hope that they may be possible of adoption.

Let the program next year include a rousing session on "Education as a Science, rather than as an Art." Those of you who are familiar with the proceedings of the society know that we have had the subject of education considered as an art dealt with from many points of view. Until this meeting, little, if anything, has been done to consider the rationale and science of our chosen profession of

education. Let the best minds in the educational world tell us, and in a practical way, all that time will permit concerning the science of education, including its psychology, as applied to engineering education. Schools of salesmanship have their special courses in the psychology of their chosen vocation; but did any one ever hear of a course in psychology being demanded as a part of the necessary training required for the engineering teacher? As training and instruction in the normal school are required of grammar school teachers, and as graduation from a college of arts or of education is expected or demanded from the would-be high school teacher, and since successful courses are given in our colleges of education on how to teach mathematics, chemistry and physics, surely courses are needed on how to teach the applications of these subjects. Hence I claim that some professional training in education should be required of the man who desires to impart his knowledge and to train young men for the practice of the engineering profession. We are engineering educators. Why should we be required to possess much professional knowledge and training in engineering and none in education?

And this leads me to my last suggestion, which is that the faculties of some of those universities which maintain colleges both of engineering and of education should offer in their summer terms strong courses of study in psychology and in education considered both as a science and as an art. These should be conducted by their most virile and experienced men, and college presidents, deans and heads of departments should be requested to influence their younger assistants and fresh graduates who expect to go permanently into the work of education to take these proposed courses of study in the summer term in preparation for their work in the college of engineering in the succeeding year. If this is done, more engineering teachers will become engineering educators.

STEVENS GETS SELDEN PATENT SUIT EXHIBITS

THE exhibits in the famous Selden patent suit, which was contested in the courts for about ten years, to determine priority in the invention of a practical automobile, have been presented to Stevens, as announced by President Humphreys at the annual meeting of the Alumni Association last June. These exhibits comprise the following:

1. A Patent Office model of the Selden patent.
2. Two working models of engine and parts, partly glass.
3. A full-sized vehicle fac-simile of the patent drawing, known as the "Selden 1877 model."
4. A Ford car of 1904, used for proof of infringement.
5. Another full-size car, copied from the patent to prove operativeness.
6. Two horizontal Brayton engines made and used in the 70's in motor boats; they are very heavy and were used to show the state of the art of liquid hydrocarbon engines at that time.
7. A single cylinder, like Selden engine, for test.
8. A clutch, said to be used in an experimental motor 'bus in Pittsburgh, in the 70's.
9. A number of small parts in connection with the vehicle and engine exhibits.

These exhibits, which make a very valuable addition to the history of the automobile and the internal combustion engine, were obtained for Stevens on the initiative of Hermann F. Cuntz, '93, who was the first to appreciate the importance and value of the Selden patent, and who was the "man behind the gun" during the whole course of the

celebrated contest over this patent. He was also largely instrumental in organizing the Association of Licensed Automobile Manufacturers, which afterwards became the Automobile Board of Trade, and has now been succeeded by the Automobile Chamber of Commerce, and which has had such a great influence on the automobile industry in the United States. This association dominated the great automobile shows in this country, and the automobile shows in New York, Chicago and elsewhere are still run under its auspices. When with the association, Mr. Cuntz personally arranged quarters for various engineers in the automobile industry, which led to the formation of the Society of Automobile Engineers, of which he has just been asked to serve as treasurer for a third term.

The negotiations for the transfer of the Selden suit exhibits to Stevens Tech involved many difficulties, but these were successfully overcome through the efforts of W. E. S. Strong, '92, and Mr. Cuntz, and the transfer was concluded officially by Mr. Strong and Roberts Walker, as receivers of the United States Motor Company. Besides Mr. Cuntz and Mr. Strong, various other Stevens men have been connected, in one way or the other, with this Selden litigation, which was one of the most important patent cases ever tried in the United States courts.

FEDERATION OF STEVENS ALUMNI CLUBS

THE joint committee of the Alumni Association and the various Stevens clubs has been working for some time on methods of organization, and has finally drafted the "Articles of Federation" printed below, as a tentative scheme for discussion at the first regular conference of clubs to be held on the morning of Saturday, January 10, 1914. This date has been fixed in accordance with the arrangements of the committee on a Stevens Convention. The annual dinner of the Alumni Association will be held on the evening of the same day.

The committee communicated with a large number of colleges in the United States, and received the following information in regard to federations of alumni clubs:

Harvard has had such an organization for fifteen years in which there are at present about ninety clubs. Massachusetts Institute of Technology and the University of Pennsylvania both started similar organizations last spring, known as "The Technology Clubs Associated" and the "Associated Pennsylvania Clubs." The University of Wisconsin, Cornell, Williams and Rutgers have recently appointed committees to work along the same lines. The University of California, Rensselaer and Union, among others, are very much interested in the subject, and have asked that copies of the constitution or other method of organization be sent to them as soon as some plan has been adopted by Stevens alumni.

The committee felt that the organization should start in a small way without any very elaborate constitution, by-laws, dues, etc., and, therefore, has made the "Articles of Federation" short. No conclusion has been reached as to a name, but the following have been suggested: Federation of

Stevens Clubs, Federation of Stevens Alumni Clubs and Federation of Stevens Tech Clubs.

In order that the Federation might work in perfect harmony with the Alumni Association, and that the Alumni Association might keep in close touch with the clubs, the "Articles of Federation" provide that the secretary and treasurer be the same as those in the Alumni Association, and that the chairman be *ex-officio* a member of the Executive Committee of the Alumni Association. It is proposed to have two conferences a year about the time of the meetings of the Alumni Association to which all members will be invited.

The chief objects of the federation of clubs are to obtain greater publicity for Stevens and to foster a wider acquaintance among Stevens alumni, especially among those in the various clubs. The social part of the conferences will be made an important feature.

The committee, consisting of David C. Johnson, '06, chairman; Walter Kidde, '97; Thomas C. Stephens, '00; William A. Shoudy, '99; Frederick C. Fraentzel, '83, and Frederick C. Freeman, '03, will welcome any suggestions from alumni.

Following are the proposed "Articles of Federation":

NAME.—The name of this organization shall be the Federation of Stevens Alumni Tech Clubs.

PURPOSE.—The objects of this Federation shall be, in coöperation with the Alumni Association, to further the interests, influence and efficiency of Stevens Institute of Technology; to strengthen the relations between the College and the Alumni; to foster a wider acquaintance among Stevens Alumni; and to increase the usefulness of local Stevens Alumni Clubs.

MEMBERS.—Any Stevens Alumni Club, properly organized, shall be eligible to membership.

New clubs may be elected to membership at any conference of the Federation by a majority vote of all the Clubs.

OFFICERS.—The officers of the Federation shall be a Chairman, a Secretary and a Treasurer. The Chairman shall be elected by the Clubs.

The Secretary of the Alumni Association shall be the Secretary of the Federation. The Treasurer of the Alumni Association shall be the Treasurer of the Federation. The Chairman shall be *ex-officio* a member of the Executive Committee of the Alumni Association.

The term of office shall be one year from July 1st to July 1st (coincident with the fiscal year of the Alumni Association).

Meetings.—There shall be two "Conferences" a year, preferably about the same time and place as the meetings of the Alumni Association. Special meetings may be called by the Chairman or by five of the Clubs.

Any Stevens man may attend the conferences and participate in the discussion.

Each Club, however, shall have but one vote. Clubs unable to be represented by one of their own members may appoint a proxy.

Amendments.—These articles may be amended at any conference by majority vote of all the federated clubs, provided the amendment has been proposed by at least two clubs and a copy thereof sent to all the clubs two months before the conference.

These articles and any future amendments must be ratified by the Executive Committee of the Alumni Association before they shall take effect.

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EDITORIAL COMMENT.

New Entrance Regulations

Stevens has taken a logical step in concluding to admit freshmen without entrance examinations from a restricted number of approved preparatory schools. The worth of the entrance examination has come to be more and more seriously questioned as a means of discovering whether a candidate possesses a thorough grasp of a range of preparatory work covering many years. The great majority of the colleges of the country have inclined to the view that a certificate of diligence and success during a period of years at a secondary school of recognized efficiency means full as much as a passing mark which may be the result of the "cramming" process or good luck in hitting the high spots while reviewing. Stevens is, therefore, in excellent company in making the change. The ideal of service in the fullest measure has dictated the new policy. President Humphreys and other members of the faculty have expressed a hope that it may

result in drawing students in goodly numbers from remote sections of the country to promote a wholesome cosmopolitanism which is always beneficial. The alumni will watch the outcome with close attention.

Stevens Incomes

The income of college graduates is a matter of interest, not only to the income tax collector, but to a large number of persons who are convinced that a college education is an aid or a hindrance, as the viewpoint may be, to material advancement. The Class of 1909 has, of its own initiative, undertaken a comprehensive census of class salaries to discover what the average Stevens man earns when he has been graduated five years. This poll will be taken in such a manner that the identification of the men belonging to the various salaries will be made impossible. Thus it is hoped to obtain figures from every man in the class. Particular attention will also be paid to tabulating and collecting the data in a way which will reveal the *earning* power of the men apart from income which comes without effort. This is an activity which might well be taken up by other classes, since the class is essentially a unit better adapted to elicit the information than the Alumni Association.

Get in Line!

With the Stevens Convention in early January an assured fact, reservations promising to tax one of New York's largest theatres at the second Stevens theatre party, and the monthly Stevens luncheon in New York a popular recurrent function, the fall and winter activities of the alumni are in a most flourishing state. The get-together spirit is in the air and no one is searching for an antitoxin.

ALUMNI DIRECTORY

ALUMNI ASSOCIATION OFFICIALS

President....................................J. H. Cuntz, '87
First Vice-President..........................J. Alfred Dixon, '91
Second Vice-President....................William E. S. Strong, '92
Secretary................................Gustav G. Freygang, '09
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Trustees: John S. DeHart, '90; J. A. Dixon, '91; Walter Kidde, '97; R. W. Pryor, Jr., '02; Gustav G. Freygang, '09.

Alumni Trustees: Walter Kidde, '97; John W. Lieb, Jr., '80; Ernest H. Peabody, '90.

Stevens Institute Alumni Association (European Branch)—Lafayette D. Carroll, '84, *Acting Secretary*, 36–38 Victoria St., London, S. W., England.

Stevens Club of Newark—W. R. Halliday, '02, *Secretary*, Stevens Institute of Technology, Hoboken, N. J.

Stevens Club of Brooklyn—William E. Paulson, '04, *Secretary*, 13 Fulton St., Brooklyn, N. Y.

Southern Alumni Club—A. M. Norris, '07, *Secretary*, 1412 Continental Bldg., Baltimore, Md.

Stevens Club of Philadelphia—J. B. Klumpp, '94, *Secretary-Treasurer*, U. G. I. Co., Philadelphia, Pa.

Stevens Club of Schenectady—Richard H. Marvin, '03, *Secretary-Treasurer*, General Electric Co., Schenectady, N. Y.

Wisconsin Stevens Club—Cornelius T. Myers, '00, *Secretary*, 44 Pingree Ave., Detroit, Mich.

Western Stevens Club—A. K. Hamilton, '95, *Secretary*, 72 West Adams St., Chicago, Ill.

Stevens Club of Pittsburgh—E. A. Condit, Jr., '02, *Secretary-Treasurer*, 2348 Oliver Bldg., Pittsburgh, Pa.

New England Stevens Club—F. M. Gibson, '01, *President*, American Sugar Refining Co., Boston, Mass.

Stevens Tech Club of Michigan—L. J. Schneider, '11, *Secretary*, 754 Woodward Ave., Detroit, Mich.

CLASS REPRESENTATIVES

'73.—J. A. Henderson, 120 North 19th St., Philadelphia, Pa.
'74.—H. W. Post, Box 415, Mountain Lakes, Boonton, N. J.
'75.—S. D. Graydon, Stevens Institute of Technology, Hoboken, N. J.
'76.—A. Riesenberger, Stevens Institute of Technology, Hoboken, N. J.
'77.—F. E. Idell, 50 Church St., New York City.
'78.—A. A. DeBonneville, 132 Nassau St., New York City.
'79.—John S. Cooke, 364 Broadway, Paterson, N. J.
'80.—J. W. Lieb, Jr., 55 Duane St., New York City.
'81.—R. M. Dixon, 2 Rector St., New York City.
'82.—Hosea Webster, 85 Liberty St., New York City.
'83.—F. C. Fraentzel, 804 Broad St., Newark, N. J.
'84.—W. L. Lyall, 439 Aycrigg Ave., Passaic, N. J.
'85.—A. W. Burchard, 30 Church St., New York City.
'86.—F. A. LaPointe, 63 Eighth St., Hoboken, N. J.
'87.—J. D. Flack, "Orienta," 302 West 79th St., New York City.
'88.—Richard Beyer, 902 Hudson St., Hoboken, N. J.
'89.—F. J. Gubelman, 47 West 34th St., New York City.
'90.—E. H. Peabody, 85 Liberty St., New York City.
'91.—C. G. Atwater, 17 Battery Place, New York City.
'92.—W. O. Ludlow, 12 West 31st St., New York City.
'93.—E. D. Lewis, 185 Madison Ave., New York City.
'94.—G. B. Fielder, Cartaret Trust Co., Sip Ave., Jersey City, N. J.
'95.—A. F. Ganz, Stevens Institute of Technology, Hoboken, N. J.
'96.—W. H. MacGregor, 165 Broadway, New York City.
'97.—J. M. Towne, 54 Walnut St., East Orange, N. J.
'98.—Robert Boettger, United Piece Dye Works, Lodi, Bergen Co., N. J.
'99.—J. S. Henry, Safety Car Htg. & Ltg. Co., 2 Rector St., New York City.
'00.—H. L. Underhill, Consolidated Gas Co., 501 East 21st St., New York City.
'01.—A. Siegele, Jr., 167 Lenox Road, Flatbush, Brooklyn, N. Y.
'02.—L. K. Lydecker, 2 Rector St., New York City.
'03.—S. H. Lott, Stevens Institute of Technology, Hoboken, N. J.
'04.—C. E. Hedden, Stevens Institute of Technology, Hoboken, N. J.
'05.—I. R. Lewis, care of Walter Kidde, 140 Cedar St., New York City.
'06.—L. A. Hazeltine, Stevens Institute of Technology, Hoboken, N. J.
'07.—Peter Minck, Kilbourne & Jacobs Mfg. Co., 25 Broad St., New York City.
'08.—G. D. Thayer, 24 Monticello Ave., Jersey City, N. J.

'09.—G. E. Terwilliger, 1 Liberty St., New York City.
'10.—Nelson Ogden, New London Ship & Engine Co., Groton, Conn.
'11.—S. J. Bell, Babcock & Wilcox Co., Bayonne, N. J.
'12.—Russell G. Hess, 709 Billings Ave., Paulsboro, N. J.

ALUMNI COMMITTEES

STANDING

Graduates Fund

Henry Torrance, '90, *Chairman*
Anson W. Burchard, '85
J. L. Coker, '88
George Dinkel, '88
J. A. Dixon, '91
Walter Kidde, '97

Securities of Life Membership Fund

J. A. Dixon, '91, *Chairman*
J. S. DeHart, Jr., '90
Walter Kidde, '97
R. W. Pryor, Jr., '02
G. G. Freygang, '09

Increase of Membership

J. A. Dixon, '91, *Chairman*
F. DeR. Furman, '93
J. M. Towne, '97
Robert Boettger, '98
T. C. Stephens, '00
Peter Minck, '07

Castle Headquarters

George Dinkel, '88, *Chairman*
W. D. Hoxie, '89
J. A. Dixon, '91
F. A. Muschenheim, '91
W. O. Ludlow, '92

Publicity

G. E. Terwilliger, '09, *Chairman*
F. DeR. Furman, '93
D. C. Johnson, '06
C. C. Phelps, '08

Athletic

G. B. Fielder, '94, *Chairman*
E. H. Bedell, '05
Henry F. Pratt, '06
Stewart J. Bell, '11

Stevens Clubs

D. C. Johnson, '06, *Chairman*
Walter Kidde, '97
T. C. Stephens, '00

Luncheon

R. S. Kursheedt, '80, *Chairman*
H. DeB. Parsons, '84
F. A. Muschenheim, '91
T. C. Stephens, '00
R. W. Pryor, Jr., '02
E. Q. Horton, '05.

ALUMNI DIRECTORY

ANNUAL

Midwinter Convention

Walter Kidde, '97, *Chairman*
D. S. Jacobus, '84
H. M. Brinckerhoff, '90
W. E. S. Strong, '92
D. C. Johnson, '06
G. E. Terwilliger, '09

Annual Banquet

W. E. S. Strong, '92, *Chairman*
W. C. Cuntz, '92
H. E. Griswold, '93
R. C. Post, '98
J. C. Hegeman, '05
C. G. Michalis, '07

Theatre Party

B. F. Hart, Jr., '87, *Chairman*
W. D. Hoxie, '89
E. H. Peabody, '90
F. A. Muschenheim, '91
E. O. Heyworth, '06

Auditing

F. E. Law, '92, *Chairman*
H. B. Atkins, '92
R. E. Willis, '07

SPECIAL

Morton Memorial Volume

F. DeR. Furman, '93

Denton Testimonial

D. S. Jacobus, '84, *Chairman*
W. F. Zimmerman, '76
W. D. Hoxie, '89
August Siegele, Jr., '01
R. W. Pryor, Jr., '02

Song Book

E. H. Peabody, '90, *Chairman*
Henry Torrance, Jr., '90
C. G. Atwater, '91
W. A. Shoudy, '99

Addressing Machine

T. C. Stephens, '00, *Chairman*
F. J. Gubelman, '89
Walter Kidde, '97

Geographical Directory

G. G. Freygang, '09, *Chairman*
D. C. Johnson, '06
C. C. Phelps, '08
G. E. Terwilliger, '09

NEWS OF STEVENS MEN

'75

Isaac N. Knapp represented the Natural Gas Association at the organization meeting of the American Petroleum Society at Pittsburgh, Pa., on August 1.

'77

Maurice Coster has been appointed chairman of the Board of Examiners of the American Institute of Electrical Engineers for the present fiscal year. This is the seventh consecutive year Mr. Coster has been a member of this important committee, an honor which is highly regarded in the electrical world.

'81

H. Van Atta's present address is 164 West 147th Street, New York City.

'82

A. A. Righter is now with the Water Arch Furnace Company, Suite 1252, First National Bank Building, Chicago, Ill.

William E. Gibbs' address is The Engineers' Club, 32 West 40th Street, New York, N. Y.

'84

William R. Aldrich has been appointed acting professor of Electrical and Mechanical Engineering, University of Arizona, during the Sabbatic leave of absence of Prof. W. W. Henley, following Mr. Aldrich's past two years with the United States Reclamation Service, Shoshone Project, Powell, Wyo.

'87

J. Day Flack's home address is P. O. Box 45, West Summit, N. J.

Julius Salisch is with the General Electric Company, 30 Church Street, New York, N. Y.

Robert N. Baylis was married to Miss Lilian Burt, daughter of Mrs. Silas Wright Burt, on August 4, in New York.

'88

Alten S. Miller has been spending several months examining the gas fields of Hungary.

NEWS OF STEVENS MEN

'90

ANDREW MOORE LOCKETT has received an appointment from the governor of Louisiana as a member of the Board of Port Commissioners of the port of New Orleans, which includes, besides the city itself, all the shipping facilities above and below New Orleans within a range of about ten miles. The board has complete control of all the docks, wharves and floating craft belonging to the state, in and about the City of New Orleans. The board has under it a staff of deputy commissioners and engineers.

'92

A monograph, entitled "A Review of Liability and Workmen's Compensation Loss Reserve Legislation," has recently been published by FRANK E. LAW, who is vice-president of the Fidelity and Casualty Company, of New York.

'93

Announcement has been made of the engagement of HERMAN F. CUNTZ and Miss Lydia H. K. Edwards of Kew, Long Island, daughter of the late Tryon Hughes Edwards, Esq., of Hagarstown, Md. Miss Edwards is a sister-in-law of WILLIAM C. CUNTZ, '92, and she is a descendant of Jonathan Edwards, the famous New England philosopher and theologian of the eighteenth century, who became the third president of Princeton.

'95

Prof. ALBERT F. GANZ has been reappointed chairman of the Electrochemical Committee of the American Institute of Electrical Engineers. Professor Ganz has also been appointed a member of the Street Lighting Committee of the National Electric Light Association.

GUY HOPKINS has been appointed acting general superintendent of the Morgan's Louisiana and Texas Railroad and Steamship Company, and the Louisiana Western Railroad Company, to succeed H. W. Sheridan, resigned. Speaking of the appointment, the New Orleans *Picayune* says: "The appointment of Mr. Hopkins will prove a popular one, as there is no man in local railroad circles who enjoys a higher reputation for thorough efficiency or is more admired for his many good qualities."

The address of RICHARD GUNAGAN is 1463 Dean Street, Brooklyn, N. Y.

'96

E. B. BUMSTED is located in the First National Bank Building, San Francisco, Cal.

The present address of ALLEN E. WHITMAN is P. O. Box 98, Weehawken, N. J.

'99

S. C. Yeaton's address is 28 Fuller Place, Brooklyn, N. Y.

Henry W. Crowell is now superintendent of the Inspection Department, Globe Indemnity Company, 45 William Street, New York, N. Y.

'00

Cornelius T. Myers' present address is 44 Pingree Avenue, Detroit, Mich.

'01

C. D. Chasteney has sold his interest in the Turbine Equipment Company of New York to become general superintendent and assistant manager of Louis Dejonge Co., manufacturers of coated paper, at Fitchburg, Mass. His home address is 170 Prichard Street, Fitchburg, Mass.

Clarence T. Coley has resigned his position as supervising engineer and director of the real estate managers, Douglas Robinson, Charles S. Brown Company, No. 14 Wall Street, and has accepted a position of operating manager for the new thirty-six story Equitable Building, to be built on the lot bounded by Broadway, Nassau, Pine and Cedar Streets, which will be the largest office building in the world, and will contain about 4,000 horsepower of boiler capacity, and 2,600 k. w. engine-driven electric generator, with ice-making machinery, forty-nine elevators and other equipment on a similar scale.

William Bland has announced the engagement of his niece, Miss Mary Elizabeth Treese, of Marion, Ohio, to August Siegle, Jr.

R. R. Jones has severed his connection with Albert M. Allen, consulting engineer of Cleveland, Ohio, to enter the employ of the Firestone Tire and Rubber Company, at Akron, Ohio.

Henry J. Botchford read a paper on June 6 at the Interstate Cotton Oil Mill Superintendents' Convention at Atlanta, Ga.

J. J. Sinclair is with the New York Municipal Railway Corporation, 85 Clinton Street, Brooklyn, N. Y.

'02

Prof. C. B. Le Page has been elected a member of the Illuminating Engineering Society.

Howard Hoffman's address is 207 Poplar Avenue, Wayne, Pa.

'03

F. C. Freeman is with the United Gas Improvement Company, Philadelphia, Pa.

'04

The mailing address of V. J. HEDDEN is 431 Ogden Street, Newark, N. J.

A daughter was born to Mr. and Mrs. CHARLES W. DUNLOP, at Maplewood, N. J., July 18, 1913. Mr. DUNLOP has been recently appointed general superintendent of the Pintsch Compressing Company, with offices at 2 Rector Street, New York.

'05

E. H. BEDELL'S address is in care of Metallurgical & Chemical Engineering, 239 West 39th Street, New York City.

'06

T. M. CONDIT'S home address is 86 North Walnut Street, East Orange, N. J.

'07

The home address of S. A. NAUHEIM is 66 Holmes Street, Waterbury, Conn.

C. G. MICHALIS is with the Torsion Balance Company, 92 Reade Street, New York City.

H. R. JARVIS is connected with the United States Reclamation Service, Arrowrock Dam, Idaho.

'08

The present address of A. S. HARLOW is 1470 North Street, Springfield, Mass.

A. L. VAN SYCKLE'S address is Hackettstown, N. J.

On September 10 a daughter was born to Mr. and Mrs. C. W. ARTHUR STEINMETZ. She has been named Ethel Emma.

Mr. and Mrs. Warren Beebe Flanders have announced the marriage of their daughter, Dorothy Ethel Bacon, to HAROLD O. WOOLLEY on September 24, at Havana, Cuba.

'09

JOHN HENRY PEPER, JR., was married to Miss Mabel Brauckmuller, only daughter of Mr. and Mrs. August Brauckmuller, at the Hotel St. George, Brooklyn, N. Y., on Thursday, September 25. Among the ushers were three of the groom's classmates, OTTO E. DRAUDT, CHARLES A. STEWART and GERALD E. TERWILLIGER. Mr. and Mrs. Peper will reside at 404 Hancock Street, Brooklyn.

OTTO E. DRAUDT is now assistant to the purchasing agent of the American Ever Ready Company, New York City.

The engagement has been announced of SIDNEY CORNELL, *ex* '09 to Miss Edna Gulbranson of East Milton, Mass.

Mrs. Martha Woodruff Mayer has announced the marriage of her daughter, Margaret Strohauer, to Walter von Voigtlander on September 20, at Bridgeton, N. J. Mr. and Mrs. von Voigtlander will reside at 40 Atterbury Avenue, Trenton, N. J.

Miss Miriam Paillard, daughter of Mrs. Alfred E. Paillard of Park Hill, was married on July 13 to Howard A. Skinner, *ex* '09, at the home of the groom's parents, Mr. and Mrs. Albert L. Skinner, 197 Shonnard Terrace, Yonkers, N. Y. Mr. and Mrs. Skinner will live in Stamford, Conn.

A. F. Wright has returned from a trip to the Pacific Coast in the interest of the American Button Company and Wright Manufacturing Company of Newark, N. J.

Frank L. Eidmann has been appointed instructor in thermo-dynamics and in mechanical engineering at the Rensselaer Polytechnic Institute.

'10

On June 4 a son was born to Mr. and Mrs. F. A. Weisenbach. Mr. Weisenbach is connected with the Central Construction & Supply Company, and lives at 5516 Poplar Street, Philadelphia, Pa.

J. A. Messenger is in the Construction Department of the United Gas Improvement Company, Broad & Arch Streets, Philadelphia, Pa.

The present home address of John Murphy, Jr., is 80 Westervelt Place, Passaic, N. J.

'11

Raymond L. Thompson is manager of the feed water department of the International Pump Company.

William G. H. Brehmer has been appointed instructor in mechanical engineering at the University of Pennsylvania, Philadelphia, Pa.

J. L. Myers is with the Michenor Stowage Company, Whitehall Building, New York, N. Y.

G. L. Mitchill is with the Electric Bond & Share Company, 71 Broadway, New York City. His home address is 106 Hamilton Avenue, New Brighton, S. I., N. Y.

Ernest O. Hickstein is with the Quapaw Gas Company, Bartlesville, Okla.

'12

Marcus Stern's present address is 940 Fox Street, Bronx, N. Y.

The address of Harold C. Noe is P. O. Box 216, Oconomowoc, Wis.

E. Byron is in the Experimental Department of the Goodyear Tire and Rubber Company, Akron, Ohio. His home address is 32 South Prospect Avenue, Akron, Ohio.

A. E. Bauhan is with the Appalachian Power Company at Bluefield, W. V. He was formerly with the same company at Byllesby, Va.

L. R. Anderson delivered an address on the economic use of gasolene in motor vehicles at the New York Furniture Warehousemen's Convention at Shelter Island, N. Y., in July.

An eight-pound daughter was born to Mr. and Mrs. Russell G. Hess on August 13. She is the 1912 "Class Baby" and has been named Doris Virginia.

'13

Following are the business positions of members of the class which graduated last June:

Henry J. Appert, Jr., assistant manager, Claremont Power Co. & Colonial Power & Light Co., Claremont, N. H.

Peter R. Aronson, New Jersey Zinc Company of Pennsylvania, Palmerton, Pa.

John A. Austin, sales engineer, N. O. Nelson Manufacturing Co., 439 East 3d Street., Los Angeles, Cal.

Gerald L. Bassett, special apprentice, N. Y. C. & H. R. R. R., Depew, N. Y.

Kenneth H. Bedell, Proposition Department, The Babcock & Wilcox Co., Bayonne, N. Y.

Harold P. Bender, salesman, International Typesetting Machine Co., World Building, New York City.

Robert C. Blakslee, special apprentice, Rock Island Lines, Trenton, Mo.

John W. Bogert, Schedule Department, North River Insurance Co., 95 William St., New York City.

T. P. Bradshaw, 3 Manning Square, Albany, N. Y.

J. Herbert Brautigam, American-La France Fire Engine Co., Elmira, N. Y.

John Collins, Jr., assistant in testing, Edison Electric Illuminating Co. of Brooklyn.

T. R. Eilenberg, special apprentice, Motive Power Department, N. Y. C. & H. R. R. R., 3 Manning Square, Albany, N. Y.

Arthur W. Frundt, draftsman, Carbondale Machine Co., Carbondale, Pa.

Henry F. Gremmel, liability inspector, Fidelity & Casualty Co., 92 Liberty St., New York City.

E. M. Hammerschlag, The Jersey City Stock Yards Co., Jersey City, N. J.

Walter O. Hoermann, inspector, Riter-Conley Manufacturing Co., Chester, Pa.

Chester Kingsbury, special apprentice, Union-Pacific Shops, Odgen, Utah.

R. H. Lansdell, United Gas Improvement Co., Broad & Arch Sts., Pahildelphia, Pa.

Nichol H. Memory, Construction Department, Isbell-Porter Co., 46 Bridge St., Newark, N. J.

Kenneth R. Millspaugh, general engineer, Higginson Mfg. Co., Newburgh, N. Y.

Edwin K. Mosier, Engineering Department, Carnegie Steel Company, Farrell, Pa.

Waldemar G. Nichols, Underwriters' Association of the Middle Department, 316 Walnut St., Philadelphia, Pa.

Robert M. Oram, American Telephone & Telegraph Co., 24 Walker St., New York City.

Raymond P. Pennoyer, engineer draftsman, Carnegie Steel Company, Homestead, Pa.

George G. Potterton, Engineering Department, United Piece Dye Works, Hawthorne, N. J.

Jerome Strauss, metallurgist, Illinois Steel Co., South Works, South Chicago, Ill.

John Tucker, Jr., tester, New York Edison Co., 92 Vandam St., New York City.

John H. Vander Veer, Stone & Webster Management Association, 147 Milk St., Boston, Mass.

Carleton Wandel, special apprentice, Pennsylvania R. R., Altoona, Pa.

German J. F. Weber, estimator, Walker & Chambers, 222 East 41st St., New York City.

Theodore W. Weigele, cadet engineer, Public Service Gas Company, 35 Front St., Newark, N. J.

Robert L. Wellman, draftsman, Standard Oil Co., Constable Hook, Bayonne, N. J.

Ralph H. Williams, Stone & Webster Management Association, 147 Milk St., Boston, Mass.

Nelson A. Zeiger, cadet engineer, Public Service Gas Company of N. J., Jersey City, N. J.

P. R. Anderson and Miss Frances Alexa Stuart, daughter of Mr. and Mrs. Charles Stuart, of 929 Willow Avenue, Hoboken, were married on July 27 in the rectory of the Church of Our Lady of Grace, at Hoboken.

ALUMNI NEWS

STEVENS CONVENTION IN JANUARY

Plans for the first Stevens Convention, to be held on January 9–10, 1914, are rapidly rounding into shape. The convention will open on Friday afternoon, January 9, with a Technical Conference in the college auditorium on "Public Service Utilities, Laws and Their Workings." There will be a discussion of this most vital topic by experts among the Stevens alumni. Some of those who will be invited to speak are President Alexander C. Humphreys, John W. Lieb, Jr., '80, third vice-president and associate general manager of the New York Edison Company; James E. Sague, '83, member of the Public Service Commission of New York; and George J. Roberts, '84, first vice-president of the Public Service Corporation of New Jersey.

On Friday evening an informal dinner for guests of the conference and alumni will be held at Castle Stevens, and later in the evening the midwinter meeting of the Alumni Association will be held at the Castle.

A conference of Stevens alumni clubs at Castle Stevens will be scheduled for Saturday morning, and some special function, details of which will be announced later, will be the attraction on Saturday afternoon. This may be in the nature of an inspection trip, but in any event will be concluded early enough to give the alumni opportunity to jump into evening dress for the concluding event of the convention, the annual alumni dinner, which will be held at the Hotel Astor, New York City.

It is believed that many alumni who do not feel that they can get to New York for the alumni dinner alone, will take the opportunity of devoting a week-end to Stevens activities when the various functions are grouped together in the manner outlined.

The general committee in charge comprises Walter Kidde, '97, chairman; D. S. Jacobus, '84; H. M. Brinckerhoff, '90; W. E. S. Strong, '92; F. DeR. Furman, '93; D. C. Johnson, '06, and G. E. Terwilliger, '09.

THEATRE PARTY DECEMBER 5

The second annual Stevens Theatre Party, held in accordance with the unanimous vote of those who attended last year's performance, will be

held on Friday evening, December 5. Notices will shortly be sent to all alumni describing the details of the plans for the evening. In order to give the affair a still stronger Stevens flavor, it is planned this year to charter the top gallery as well as the orchestra, boxes and first balcony, and to turn the "peanut heaven" over to the undergraduates. After the performance it is planned to hold a reception at the Hotel Astor for those who care to participate.

MICHIGAN ALUMNI ADOPT NEW NAME

At an enthusiastic meeting of the Michigan alumni at the home of Austin Church ,'95, at Trenton, Mich., on September 27, it was decided to rename the club the "Stevens Tech Club of Michigan." In the afternoon the party enjoyed fishing, and then limbered up with a little lacrosse. After dinner a business and social session was held, at which many matters of intimate interest to alumni were discussed, including the proposition to form a federation of Stevens alumni clubs, which was looked upon unfavorably as conflicting with the province of the Alumni Association. Announcement was also made that a Monday noon-day luncheon would be held every week at the Hotel Cadillac in Detroit, at which all Stevens Alumni would be made welcome. Among those present at the meeting were Austin Church, '95, E. T. Birdsall, '86, J. C. Danzinger, '89, L. J. Schneider, '11, C. T. Myers, '00, H. H. Haynes, '10, R. S. Lane, '08. A column and a half account of the meeting appeared on the first page of the *Trenton* (Mich.) *Times* for October 3, 1913.

ALUMNI DINNER OF 1913

At the request of many alumni, the photograph of the 1913 Alumni Dinner at the Hotel Astor, which, through inadvertence on the part of the publisher, was omitted from the April issue of The Indicator, is here reproduced.

EXECUTIVE COMMITTEE MEETING

The Executive Committee of the Alumni Association met in New York City at the Lawyers Club on Wednesday, July 2, 1913. The meeting was called to order at 1 P. M. by President J. H. Cuntz. The other members present were J. A. Dixon, L. A. Martin, Jr., H. E. Griswold, R. C. Post, R. W. Pryor Jr., J. S. DeHart, Jr., F. E. Law, Walter Kidde, E. H. Peabody and G. G. Freygang. Dr. A. C. Humphreys and A. P. Trautwein,

Annual Banquet of the Alumni of Stevens Institute of Technology, celebrating the completion of ten years service of Dr. Alexander C. Humphreys as President of Stevens. Held at the Hotel Astor, February 14, 1913.

past presidents of the association, and G. E. Terwilliger, Managing Editor of the INDICATOR, were also present. T. C. Stephens attended by invitation.

The minutes of the previous meeting, having been sent to all members of the Executive Committee, were approved as written upon motion made by Mr. Dixon, seconded by Mr. Griswold.

Professor Martin read the Treasurer's report for the year 1912–13. At the conclusion of the report Mr. Pryor moved that the Treasurer's report be accepted, pending the report of the Auditing Committee. Seconded by Mr. Freygang and unanimously carried.

President Cuntz called for a report from the retiring president, E. H. Peabody, who stated he had no formal report to make.

President Cuntz read the following report of the Committee on the Securities of the Life Membership Fund:

"*Gentlemen:*—Your Committee on the Securities of the Life Membership Fund begs to submit the following report, as a supplement to its report of March 12, 1913, to which reference is made:

"It is believed that everything stated in our report of March 12, 1913, about the bonds of the Bush Terminal Company and those of the Middlesex and Somerset Traction Company still holds good, and that they are as safe as they were then.

"The market price of the preferred stock of the American Tobacco Company, of Liggett and Myers Company and P. Lorillard Company has fallen since our last report, probably partly owing to political influences, but there seems no danger of the dividends on these stocks being passed. These stocks could be sold only at a loss now, and your committee recommends that they be undisturbed for the present, but that they be carefully watched.

"The members of this committee hereby tender their resignations to take effect July 1, 1913.

"Respectfully submitted

J. H. CUNTZ
GEORGE DINKEL
R. W. PRYOR, JR."

At the conclusion Mr. Post moved that the report be accepted. Seconded by Mr. Griswold. Unanimously carried.

The report of the Increase of Membership Committee followed. Mr. Dixon moved that the Executive Committee recommend the election of J. Herbert Ballantine, *ex* '87, to associate life membership in the Alumni

Association at the next regular meeting of the association. Mr. Peabody seconded the motion. Unanimously carried.

The following men, having complied with the requirements of the constitution were presented to the Executive Committee for election to life membership: Harold E. Griswold, '93; E. J. J. Sievers, '09.

Mr. Dixon moved that these men be elected to life membership and that they be sent by the Secretary proper notice of their election and acknowledgment of their remittance, also that they be accorded all privileges according to the constitution. Seconded by Mr. Peabody. Unanimously carried.

The following men having complied with the requirements of the constitution were presented to the Executive Committee for reinstatement to active membership: D. H. Lopez, '88; Harold B. Atkins, '93.

Mr. Dixon moved that these men be reinstated to active membership and that they be sent by the Secretary proper notice of their reinstatement and acknowledgment of their remittances, also that they be accorded all privileges according to the constitution. Seconded by Mr. Peabody. Unanimously carried.

T. C. Stephens reported progress for the Committee on Stevens Clubs.

Mr. Griswold reported that the Class of '93 was making an effort to get as many men as possible from the Class of '93 to become life members.

Mr. Terwilliger reported for the Publicity Committee.

Mr. Stephens reported progress for the Addressing Machine Committee.

Mr. Peabody reported for the 1913 Alumni Day Committee in the absence of E. E. Hinkle. Mr. Kidde moved that the names of the invited guests be added to the report, and that the report be accepted with thanks. Seconded by Mr. Griswold. Unanimously carried.

Mr. Griswold moved that the surplus reported by the 1913 Alumni Day Committee be turned over to the general fund and that no money be returned to the various classes contributing; that the Secretary notify the various class representatives that the surplus was turned over to the general fund to help make up the deficits of previous years, the secretary to express the appreciation of the Alumni Association of the loyalty shown by them and their classmates. Seconded by Professor Martin. Passed unanimously.

Mr. Peabody reported that the Class of '90's contest was won by E. E. Hinkle, '90, who donated the amount of $204 to the Alumni Association. Mr. Hinkle's generous action was greatly appreciated.

Mr. Griswold moved that the term of office of the standing committees, consisting of the Graduates Fund, Life Membership Fund, Increase of Membership, Publicity, Athletic, Castle Headquarters, Stevens Clubs and

Luncheon Committees, terminate either on July 1, with the outgoing administration, or when their successors are appointed. Seconded by Mr. Kidde. Unanimously carried.

Mr. Griswold moved that the Chair appoint new standing committees. Seconded by Mr. Kidde. Unanimously carried.

President Cuntz then said that he would announce the committees at the next meeting.

Upon motion made and seconded the special committees, consisting of the Song Book, Denton Testimonial, Addressing Machine and Morton Memorial Volume committees were continued for the year 1913–14 or until discharged. Unanimously carried.

Mr. Griswold moved that the Chair appoint a committee for the purpose of arranging for a theatre party on or about December 5 or 6, 1913, and if, upon investigation, the committee found it advisable to hold a reception after the theatre party, it was to be so arranged.

President Cuntz stated that it might be arranged to hold a convention of Stevens men some time in January, the dates of the convention to be so arranged as not to conflict with any of the meetings of the various prominent engineering societies.

Mr. Griswold then moved that the annual dinner and the midwinter meeting be held in January and that the Chair appoint a committee to undertake the arrangements. Seconded by Mr. Post. Unanimously carried.

President Cuntz brought up the question of issuing a geographical directory in some convenient form, possibly in the form similar to the directory issued by the association in 1906. Mr. DeHart moved that the Secretary confer with the Registrar in connection with publishing a geographical directory in the annual catalogue of Stevens, this directory also to show the business of the alumnus immediately after his name. The Secretary was directed to report the results of this conference at the next meeting, and the President of the Alumni Association was authorized to appoint a committee.

Mr. Peabody moved that a calendar be published as early as possible after the opening of the college, and that this calendar contain as many dates as possible. Seconded by Mr. Griswold. Unanimously carried.

Mr. Kidde moved that the question of a monthly publication be referred to the Publicity Committee. Seconded by Mr. Griswold. Unanimously carried.

Mr. Kidde moved that the schedule of meetings of the Executive Committee be as follows: September 17, October 8, November 12, December 10,

January 9, and, be held immediately preceding the midwinter meeting. Seconded by Mr. DeHart. Unanimously carried.

Mr. Peabody moved that the names of the men dropped from the rolls of the association for non-payment of dues be sent to the Increase of Membership Committee. Seconded by Mr. Freygang. Unanimously carried.

President Cuntz stated that the Trustees of the Alumni Association should really constitute the Committee on the Securities of the Life Membership Fund, and he, therefore, appointed Messrs. Dixon, DeHart, Freygang, Kidde and Pryor as the committee for the ensuing year.

Mr. Terwilliger brought up the question of changing the name of the publishers of the STEVENS INDICATOR, the wording at the present time being "Stevens Indicator, Published by the Alumni and Undergraduates of the Stevens Institute of Technology." Since it is not customary for the undergraduates to have any connection with an alumni publication, Mr. Terwilliger requested that the wording "Alumni and Undergraduates of the Stevens Institute of Technology" be changed to "Alumni of Stevens Institute of Technology." Mr. Post moved that Mr. Terwilliger's suggestion be adopted and that the wording of the phrase be changed to "Alumni of Stevens Institute of Technology." Seconded by Mr. Griswold. Passed unanimously.

Mr. Freygang moved that the loss of $19.68 reported by the STEVENS INDICATOR previous to January 1, 1913, be paid to the INDICATOR by the Almuni Association. Seconded by Mr. Peabody. Unanimously carried.

The Secretary reported that Mr. Terwilliger, Managing Editor, and Professor Martin, Treasurer, were desirous of instituting a voucher system for the STEVENS INDICATOR, and that before this system could be inaugurated the Executive Committee would have to authorize the bank to accept the signatures of both the Managing Editor and Treasurer. Mr. Griswold then moved that the Managing Editor of the STEVENS INDICATOR and the Treasurer of the Alumni Association of Stevens Institute of Technology be authorized to open an account in the First National Bank of Hoboken, which is hereby authorized to recognize the joint signatures of the Managing Editor, Gerald E. Terwilliger, and Treasurer, Louis A. Martin, Jr., in payment of checks, drafts, notes and other evidences of indebtedness until further notice. Seconded by Mr. Post and unanimously carried.

Mr. Peabody moved that the cost of the room for the meetings of the Executive Committee be borne by the association. Seconded by Mr. Post. Carried unanimously.

A motion for adjournment was made at 2.30 by Mr. Post, seconded by Mr. Kidde. Unanimously carried.

TRUSTEES OF THE ALUMNI ASSOCIATION

A meeting of the Trustees of the Alumni Association, at which were present Messrs. J. A. Dixon, J. S. DeHart, G. G. Freygang, Walter Kidde and R. W. Pryor, Jr., was held at the Lawyers Club, New York City, on July 2, 1913. Mr. Kidde moved and Mr. Freygang seconded that all the proceedings of the Executive Committee, at its meeting held July 2, 1913, be ratified. Unanimously carried.

REPORT OF THE TREASURER OF THE ALUMNI ASSOCIATION OF STEVENS INSTITUTE OF TECHNOLOGY

(From July 1, 1912, to June 30, 1913)

I. ALUMNI ASSOCIATION

Balance on hand, July 1, 1912			$264.00
Account of General Fund			
Receipts			
Dues for current year	$1,822.50		
Dues for arrears	340.00		
Dues in advance	55.00		
Dues for 154 living members	385.00		
		$2,602.50	
From class of '90 contest		204.00	
Check collections		14.35	
Anonymous		32.53	
Interest on deposit in First National Bank		7.23	
			$2,860.61
Disbursements			
Annual banquet, one-half cost of reporting		$21.00	
Calendar		15.50	
Check collections		1.10	
Clerical work prior to Dec. 1, 1912		4.00	
Executive Committee, room rent for meeting		5.00	
Life membership—cost of lettering certificates		2.15	
Lock on office door and one key		1.50	
Memorial to S. S. Palmer		20.00	
Minute book		6.00	
Photo of model of Castle		1.87	
Safe deposit box		5.00	
Salary of secretary's stenographer:			
(a) From July 1, 1911, to June 30, 1912		197.50	
(b) From July 1, 1912, to Nov. 30, 1912		150.00	
(c) From Dec. 1, 1912, to June 30, 1913		143.75	
Secretary's salary from July 1, 1912, to Dec. 1, 1912		187.42	
Secretary's office, clerical expenses		11.56	
Cardboard signs (announcing annual meeting)		6.00	
Stationery, printing and postage		161.01	
Telephone		3.70	
Treasurer's office		100.00	
Typewriter. Amount paid Stevens Institute of Technology		25.00	
			$1,069.06

Account of Alumni Day 1912

Receipts

None.

Disbursements

Stevens Tech and Castle Stevens	$126.08	
Advanced by Treasurer of Alumni Day Committee	.19	
		$126.27

Account of Alumni Day, 1913

Receipts

Old Guard	$100.00	
Classes '84, '86 to 1912 inclusive	810.00	
Classes '85, 1914, '15 and '16, 4 classes, at $5	20.00	
Class of '99	20.00	
For advertisement on menu	50.00	
Ice cream privilege	10.00	
Refreshment privilege	25.00	
Proceeds of gate receipts	66.00	
Proceeds of dinner	38.40	
Class of 1913 for loan of chairs	12.00	
		$1,151.40

Disbursements

Printing and postage of 1st notice	$12.25	
Printing of 2d notice	113.70	
Clerical work on 2d notice	3.65	
Carfare and postage on 2d notice	2.70	
Printing ticket programs	89.75	
Distributing ticket programs	3.27	
Printing letterheads and envelopes	5.75	
Engraving invitations and envelopes	24.20	
Musical programs	9.00	
Band	217.00	
Orchestra	28.00	
54 armbands at 35c	18.90	
1 sash	2.00	
Prize flags	39.25	
Flags and bunting	31.10	
Flag poles	9.00	
Brass pole ends	1.20	
3 red and 3 gray pennants	4.50	
Rental of flag	4.00	
Electrical work	86.89	
Tent	50.32	
Class signs	30.00	
Flowers for tables	30.00	
Ice	8.40	
Rental of chairs	33.00	
Refund of ice cream privilege	10.00	
Contribution to Police Pension Commission	25.00	
		$892.83

Account of Athletic Council

Receipts

From Treasurer of Council	$19.00

Disbursements

Printing	$19.00

Account of Banquet

Receipts

Sale of tickets to Alumni and guests (595)	$2,380.00	
Sale of tickets to seniors (62)	248.00	
Sale of boxes	250.00	
Refund from printer	1.41	
Advertisement on menu	50.00	
Sale of photographs	3.75	
Wines and cigars	149.75	
Anonymous	97.30	
		$3,180.21

Disbursements

Printing and postage of notices	$18.58	
Printing tickets, etc	103.70	
Menus	257.54	
Engraving	9.09	
Expressage	.85	
Hotel Astor	2,575.00	
Hotel Astor for wines and cigars	202.25	
Stevens Dramatic Society	13.20	
		$3,180.21

Account of Increase of Membership Committee

Receipts

None.

Disbursements

Cuts of plan of "Greater Stevens"	$13.20	
Printing and postage	35.84	
		$49.04

Account of Midwinter Meeting

Receipts

Sixty-one dinners		$91.50

Disbursements

Printing and postage of notices	$22.08	
Printing	5.50	
Castle Stevens	94.90	
		$122.48

Account of Publicity Committee

Receipts

None.

Disbursements

Printing		$5.50

Account of Songs of Stevens

Receipts

Sale of books		$41.25

Disbursements

None.

Account of Stevens Indicator

Receipts

None.

Disbursements

By order of the Executive Committee to pay deficit to Stevens Indicator for period July 1, 1912, to Dec. 31, 1912	$ 19.68	
For January, 1912, issue	376.50	
For April, 1912, issue	314.63	
Back numbers for 1911–12	108.38	
For July, 1912, issue	340.50	
For October, 1912, issue	350.63	
For January, 1913, issue	360.00	
For April, 1913, issue	339.38	
Back numbers for 1912–13	90.75	
		$2,300.45

Account of Stevens Institute of Technology

Receipts

None.

Disbursements

Stenographer's services at Castle $25.00

Account of Stevens Lunch

Receipts

Anonymous $7.00

Disbursements

Printing $7.00

Account of Stevens Night

Receipts

Loans from 10 members	$975.00	
Sale of boxes	200.00	
Sale of seats	2,149.50	
Contributions	35.00	
Returns of 59 dinners	29.50	
		$3,389.00

Disbursements

Klaw & Erlanger	$1,400.00	
Repayment of loans	975.00	
Postage	34.50	
Printing	19.00	
Printing and incidentals	24.75	
		$2,453.25

Account of Stute

Receipts

One subscription $1.50

Disbursements

One subscription $1.50

TOTALS

Total receipts	$11,005.47
Total disbursements	$10,251.59
Balance in First National Bank	$753.88

ASSETS

Account of General Fund:			
125 men $2.50 in arrears	$312.50		
93 men $5.00 in arrears	465.00		
	$777.50		
Assuming that 45% will be collected		$349.88	
Account of 1913 Alumni Day Committee:			
Old Guard	$25.00		
Class of '85	25.00		
Class of '99	10.00		
W. S. Ackerman, '91, for extra charge on six dinners	6.00		
Refund of overcharge on electrical work	8.12		
		74.12	
Account of Stevens Institute of Technology:			
Stenographer's services		25.00	
Account of Stevens Indicator:			
Loan as Working Capital	$700.00		
Half profits for period Jan. 1 to June 30, 1913	144.06		
		844.06	
			$1,293.06
Balance in First National Bank			753.88
Total assets			$2,046.94

LIABILITIES

Account of General Fund:				
Advance dues			$55.00	
Account of 1913 Alumni Day Committee, Stevens Institute of Technology:				
Boys tending water coolers	$7.00			
Postals	.10			
Cost of erecting and fixing tent after storm and taking down tent	16.00			
Loan to collector at gate	25.00			
		$48.10		
Estimated cost of current and transformer charges		20.00		
			$68.10	
				$123.00

II. STEVENS INDICATOR

Balance on hand, July 1, 1912		$227.11

Receipts

Advertising	$1,907.50	
Alumni subscriptions	2,280.77	
Interest on deposit in First National Bank	1.53	
Outside subscriptions	15.50	
Sales	6.00	
Undergraduate subscriptions	66.00	
Alumni Association by order of Executive Committee, for loss during period July 1 to Dec. 31, 1912	19.68	
		$4,296.98

Disbursements

Advertising Commissions	$236.18	
Alumni Association, account of W. H. Koch	1.50	
Annual Banquet, one-half cost of reporting	21.00	
Carfare	.24	
Check collection	.15	
Copyright charges	9.00	
Editor of Stevens Indicator:		
One-half gain for 1911–1912	57.74	
Editor's salary	200.00	
Engraving	111.80	
Express charges	1.62	
Handbook advertisement	9.00	
Messenger service	.90	
Petty cash	10.68	
Photographs	15.00	
Printing	3,067.05	
Stationery, printing and postage	125.26	
Stenographer's services	87.35	
Telephone	6.15	
		$3,960.62
Balance in First National Bank		563.47
Total receipts		$4,524.09
Total disbursements		$4,524.09

Condensed Balance Sheet

(For period July 1, 1912, to Dec. 31, 1912)

	Assets	*Liabilities*	*Loss*	*Gain*
Advertising	$61.29			$887.48
Advertisers (outstanding)	484.04			
Alumni Association	799.51			
Alumni Association, account of one-half profits		$57.74		
Alumni subscriptions				691.13
Capital		700.00		
Cash	549.45			
Discount			$4.58	
Engraving			85.94	
Expense	42.93		91.56	
Outside subscriptions		11.75		1.05
C. C. Phelps				.01
Printing			1,378.01	
Salary			100.00	
Sales				3.00
Trow Press		1,245.15		
	$1,937.22	$2,014.64	$1,660.09	$1,582.67
Net loss	77.42			77.42
	$2,014.64	$2,014.64	$1,660.09	$1,660.09

The net loss together with the credit of $57.74 shown above makes the net amount of $19.68 owed by the Alumni Association to the Indicator on Dec. 31, 1912.

Condensed Balance Sheet

(For period Jan. 1, 1913, to June 30, 1913)

	Assets	*Liabilities*	*Loss*	*Gain*
Advertising				$744.15
Advertising commissions	$100.47			
Advertisers, outstanding prior to Jan. 1, 1913	320.29			
Advertisers, outstanding after Jan. 1, 1913	161.94			
Alumni subscriptions				790.13
Capital		$700.00		
Cash	563.47			
Discount			$4.28	
Engraving			20.40	
Expense	8.00		99.44	
Interest				1.53
Outside subscriptions		5.20		
Printing			785.03	
Power Specialty Co		4.37		
Rumford Printing Co	5.46			
Salary			100.00	
Sales				3.00
Stenographer service			87.35	
	$1,159.63	$709.57	$1,096.50	$1,546.56
Net gain		450.06	450.06	
	$1,159.63	$1,159.63	$1,546.56	$1,546.56

Distribution of Net Gain:

*Accounts Receivable Jan. 1 to June 30, 1913	$161.94
Alumni Association, account of one-half profits	144.06
G. E. Terwilliger, account of one-half profits	144.06
	$450.06

III. MORTON MEMORIAL VOLUME

Balance on hand, July 1, 1912		$228.61	
Interest to January 1, 1913	$4.56		
Interest to July 1, 1913	4.66		
		9.22	
			$237.83

IV. BENEFICIARY FUND

Balance in fund July 1, 1912		$2,006.80
Receipts		
Interest on deposit in Hudson Trust Company (4%) from July 1, 1912, to June 30, 1913	$0.24	
Interest from loan to Stevens Institute of Technology (5%)	$100.00	
		$100.24
Disbursements		
Refund of interest to Stevens Institute of Technology by order of the Alumni Association		$100.00
		$100.00
Total receipts		$2,107.04
Total disbursements		100.00
Balance in fund, July 1, 1913		$2,007.04

*This account shows all advertising contracted for and inserted but not paid after January 1, 1913.

Investment of Beneficiary Fund

Loan to Stevens Institute of Technology	$2,000.00	
On deposit in Hudson Trust Co., July 1, 1913	7.04	
		$2,007.04

V. LIFE MEMBERSHIP FUND

Balance in Fund, July 1, 1912		$7,892.36
Receipts		
Fees from 10 new life members	$500.00	
Dividend on 13 shares of American Tobacco Company, preferred stock	78.00	
Dividend on 2 shares of P. Lorillard Company, preferred stock	14.00	
Dividend on 3 shares of Liggett & Myers Company	21.00	
Dividend of Middlesex & Somerset Traction Company	100.00	
Dividend of Bush Terminal Company	150.00	
Interest to Jan. 1, 1913	23.96	
Interest to July 1, 1913	32.56	
		$8,811.88
Disbursements		
Dues for 154 living life members		$385.00
Total receipts		$8,811.88
Total disbursements		$385.00
Balance in Fund, July 1, 1913		$8,426.88

Investment of Life Membership Fund

13 shares of American Tobacco Company, preferred stock, 2 shares of P. Lorillard Company, preferred stock, 3 shares of Liggett & Myers Company	$1,882.91	
Three $1,000 consolidated bonds (5%) of Bush Terminal Company	2,967.70	
Two $1,000 bonds (5%) of Middlesex & Somerset Traction Company	1,982.50	
On deposit in Hudson Trust Company (4%)	1,593.77	
		$8,426.88

The membership of the Association is made up as follows:

Class of Membership	Living Life Members	Good standing	1 year in arrears	2 years in arrears	Total
Active	147	797	118	91	1,153
Associate	7	21	7	2	37
Total	154	818	125	93	1,190

Total Enrollment in Life Membership Fund		158
Dropped April 1, 1913, according to Art. VII, Section 4 of the constitution:		
Active	48	50
Associate	2	
Total number of graduates, July 1, 1913		1,625
Percentage of graduates who are members of the Association		71%

Approved:

Frank E. Law, Chairman.
Robert E. Willis.
Harold B Atkins.
Auditing Committee

Respectfully submitted,

LOUIS A. MARTIN, Jr.,
Treasurer.

NEWS OF THE COLLEGE

NEW ENTRANCE EXAMINATION PLAN

As a result of agitation which was commenced last year by the Faculty Publicity Committee, students who have made satisfactory records in approved preparatory schools will be admitted to the freshmen class at Stevens without entrance examinations. The details of the new regulations are now being worked out by a committee of the faculty, and will go into full force with the class entering in the fall of 1914. The new rule resulted not from any lowering of the standard of preparation required by Stevens but from a belief that many who would make excellent students and good engineers were being led away from Stevens by the old rules. The faculty was practically unanimous in endorsing the change.

The freshman class is up to the average of recent years in numbers, and the entire outlook from a scholastic standpoint is favorable. During the past summer, a summer school was conducted for the benefit of students who were deficient in any special branches, and the results are said to be very satisfactory, especially in comparison with the haphazard review work done individually by most conditioned students.

STUTE BOARD AND STUTE ALUMNI DINE

Following the new custom of holding a dinner of *Stute* editors and former editors in the fall, a dinner was held at the Castle on October 10. A number of the older men were present to give counsel and suggestions to the present board, and an atmosphere of mutual co-operation was evident at the meeting.

STUDENT COUNCIL ACTIVE

The Student Council began its first full year of control of undergraduate activities at a meeting on October 9. This body is made up of the leaders of the various activities of the college and acts as a student governing board, except in matters concerning the honesty of examinations and term work, which are handled by the Honor Board. One of the important matters considered was the question of the Wednesday Assembly. This

is a feature of college life which is of recent date, and the Student Council, appreciating the importance of reaching the students through such regular mass-meetings discussed ways and means of making them most profitable for students and faculty alike.

ATHLETIC COUNCIL MEETS

The fall meeting of the Athletic Council, which now controls the various athletic activities of the college by co-operation between undergraduates and alumni, was held at the Castle on October 2. Reports were received from the managers of the teams, who reported the outlook to be encouraging. One of the matters considered was the holding of an alumni tennis tournament in June or July. The council emphasized its request that alumni aid in coaching the teams.

SOPHOMORES WIN CANE RUSH

In the first of the organized clashes between the two lower classes, the sophomores were victorious in the cane rush on September 26. At the end of five minutes of the struggle, the upper classmen in charge dug down to the bottom of the heap and found thirty-two hands gripping the cane, seventeen belonging to sophomores and fifteen to the freshmen. No casualties were reported.

CLASS OF 1917

Alling, H. W., 33 Spring St., Taunton, Mass.
Anderson, W. S., Jr., 186 Gregory Ave., Passaic, N. J.
Andresen, W. H., 264 Glenwood Ave., East Orange, N. J.
Antosch, W., 690 Third Ave., New York City.
Barry, J. L., Jr., 211 Clinton Ave., Jersey City, N. J.
Bass, A. H., 108 Prospect Park West, Brooklyn, N. Y.
Bergen, G. W., Old South Road, Woodhaven, N. Y.
Bergstrom, C. L., 6732 Ridge Boulevard, Brooklyn, N. Y.
Bernner, M. St. J., 46 Whitney Ave., Elmhurst, L. I., N. Y.
Black, W. A., 324 Orange Road, Montclaire, N. J.
Bohde, F. J., 151 East 81st St., New York, N. Y.
Brady, R. R., 55 Steuben St., East Orange, N. J.
Bruning, J. H., Jr., 934 Hudson St., Hoboken, N. J.
Bunn, P. H., 933 Avenue C, Bayonne, N. J.
Burnard, J. J., 2628 East 14th St., Brooklyn, N. Y.
Couse, K. W., 58 West 57th St., New York, N. Y.
Derivaux, A. J., 623 High St., Newark, N. J.

Dietz, G. L., 330 East 18th St., New York, N. Y.
Dietz, P. C., Jr., 303 Harrison Ave., Hasbrouck Heights, N. J.
Doremus, W. J., 609 14th Ave., Paterson, N. J.
Downs, W. S., 286 Essex Ave., Orange, N. J.
Doxsey, A. M., Lynbrook, N. Y.
Dreyer, H. W., 2021 Dorchester Road, Flatbush, Brooklyn, N. Y.
Dunn, R. I., 131 Riverside Drive, New York, N. Y.
Dunn, W. K., 237 Washington Ave., Brooklyn, N. Y.
Elwell, T., 345 East 35th St., Paterson, N. J.
Everett, A., 7 Retford Ave., Cranford, N. J.
Feist, S., 245 West 139th St., New York, N. Y.
Flood, H. G., 84 Edgecombe Ave., New York, N. Y.
Gavin, W. J., 166 Engert Ave., Brooklyn, N. Y.
Gerold, F. G., 23 Polhemus Place, Brooklyn, N. Y.
Given, C. R., 278 North 20th St., East Orange, N. J.
Gorman, T. L., 665 Bergen Ave., Jersey City, N. J.
Grahn, J. A., Jr., Serpentine Road, Tenafly, N. J.
Graydon, D. M., 158 Maple Ave., Ridgewood, N. J.
Hart, H., 75 Maple Ave., Morristown, N. J.
Hazard, S., 3089 Broadway, New York, N. Y.
Hiebeler, H. G., 45 E. Greenpoint Ave., Woodside, L. I., N. Y.
Hiller, P. W., 68 Laurel St., Carbondale, Pa.
Igoe, W. J., 164 Jewett Ave., Jersey City, N. J.
Johnson, R. R., 38 Washington Terrace, East Orange, N. J.
Kenly, R. G., Hagerstown, Md.
Kent, R., Tuxedo Park, N. Y.
Klett, M. J., Jr., 3709 Paulding Ave., Williamsbridge, New York, N. Y
Koehler, O. A., 310 West San Pedro Place, San Antonio, Texas.
Krollpfeifer, C. F., 113 West 118th St., New York, N. Y.
Kusel, H. F., Jr., 1000 Washington St., Hoboken, N. J.
Kynor, M. W., 22 Conover Terrace, Orange, N. J.
Lewis, O. N., 102 West Liberty St., Bridgeport, Conn.
Locke, C. A., 89 Winthrop St., Brooklyn, N. Y.
Loeffler, H. W. D., 14 Hedden Terrace, Newark, N. J.
Lubash, M., 291 Central Ave., Jersey City, N. J.
Mandell, S., 524 Grand St., New York, N. Y.
Markley, W. F., 334 Henderson St., Jersey City, N. J.
McCutchen, R. M., 701 Ocean Ave., Belmar, N. J.
McElroy, C. J., 1850 Noble Ave., Bridgeport, Conn.
McLean, A., Jr., 111 Passaic Ave., Passaic, N. J.
McQueeney, J. T., 790 Westminster Road, Brooklyn, N. Y.
Memory, C. H., 508 N. Arlington Ave., East Orange, N. J.
Meyer, J. W., Jr., 919 Clinton St., Hoboken, N. J.
Middleton, M., 122 N. Maple Ave., East Orange, N. J.
Milburn, R. P., 820 Lake St., Newark, N. J.
Miller, E. F., 433 West 23d St., New York, N. Y.
Morgan, A., 1 St. Nicholas Terrace, New York, N. Y.
Morton, E. R., 73 West Lacrosse Ave., Lansdowne, Pa.
Munroe, G. C., 626 East 24th St., Paterson, N. J.
Neidhart, L. E., 661 Jersey Ave., Jersey City, N. J.

Newbery, G. F., 45 Second St., Weehawken, N. J.
Nicolson, H. W., 3059 Q St., Washington, D. C.
O'Dougherty, E. F., 854 Park Place, Brooklyn, N. Y.
O'Neill, H. A., 449 Scotland St., Orange, N. J.
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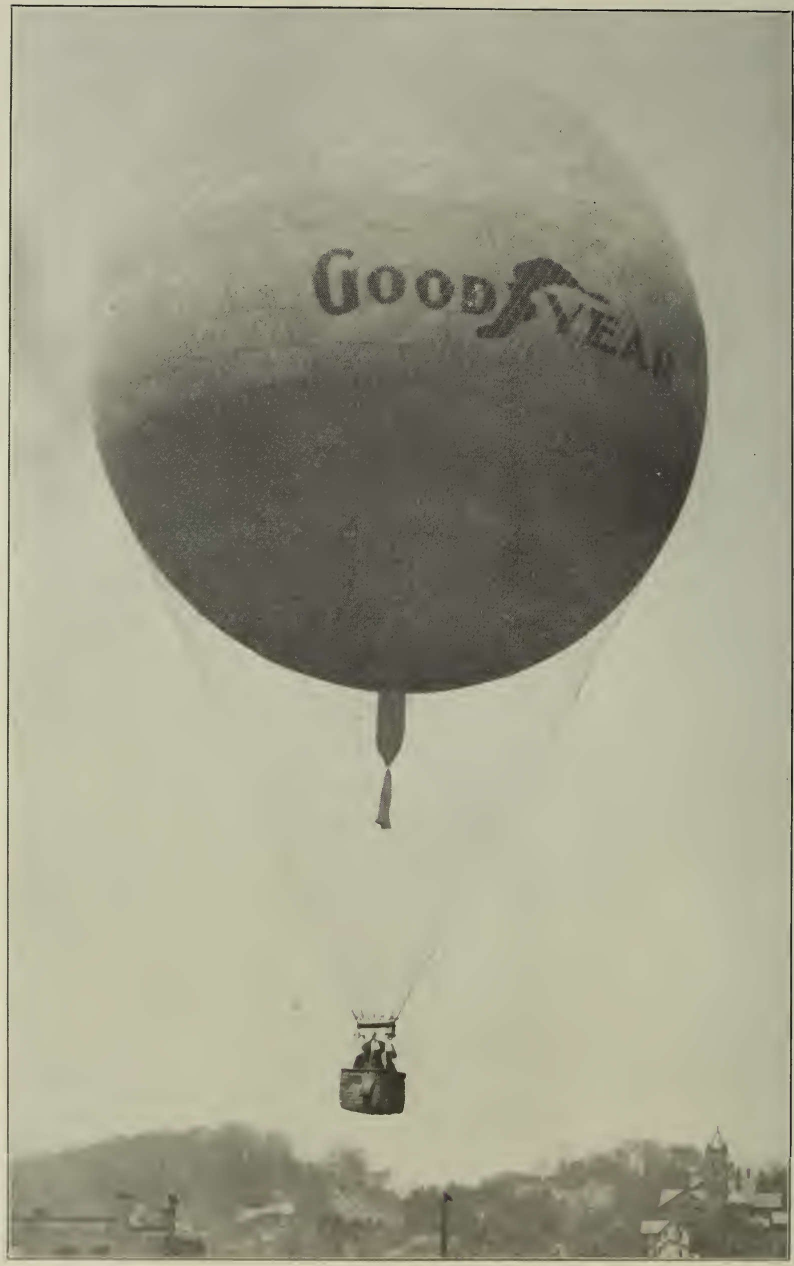

Ralph H. Upson, '10, Winner of International Balloon Race, Making Ascent from Akron, Ohio, Just Before Leaving for Europe.

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OCTOBER, 1913

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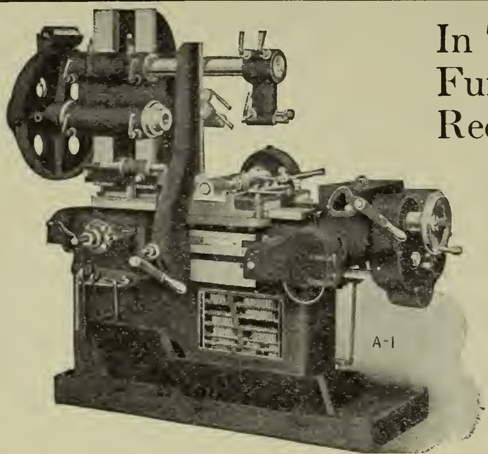
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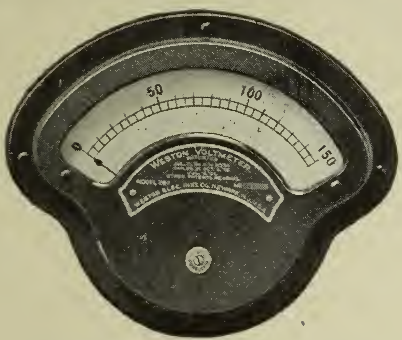

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